RAILROAD GAZETTE

FRIDAY, MAY 16.

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Contributions.

Long-Span Bridges.

The Passaic Rolling Mill Co.,
NEW YORK, May 9, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

You may add to the list of long-span bridges, published in your issue of May 2, the 432-ft. draw span, single track, over the Mississippi River at St. Paul, Minn., on the line of the Chicago, St. Paul & Kansas City Railroad, built by us in 1886.

W. O. FAYERWEATHER,
Vice-President and Treasurer.

Standard Rail Sections.

ALTOONA, Pa., May 10, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As regards the timeliness of presenting an approved form of rail section, it is never too early to do a good thing. It will not be possible at any date to establish a standard that will be acceptable to all roads, for you have doubtless noticed that we of the railroads can be just as narrow as other people, and can most complacently reject everything that is not of our own paternity. We are likely to continue in that groove as long as we live, but the committee need not be discouraged thereby. If the committee is made up of men who stand close to the rolls and close to the track, it could not be amiss to work up a series of sections embodying the best results of past practice, and send them out with their indorsement. It would not mean that the perfect section had been discovered, or even that there was no other as good, but it could be regarded as having the approval of thoughtful men, and as being a form that would surely give good service. They could not go very far wrong in presenting one of the Hawks-Delano type, especially if they were able to point to the comparative tests of the Delano and McClure sections, now being made on the Chicago, Burlington & Quincy, as being confirmatory. Quite a number of roads have already shaped their rails to that as a guide, and if the committee should put forth a section bearing their approval so large a portion of the roads would use it that the mills would be safe in rolling a stock ahead, and might possibly make an abatement in price. Progress in any department is by steps and does not go "with one fell swoop." If the committee waits until they have the absolutely perfect rail to present the grass will be growing over the graves of this set, and another and another before we are favored with any result. Standards are liable to change as the light improves, and nothing is final.

M. W. THOMSON, Engineer M. W.

Questions Concerning Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have been considerably interested of late in the evolution of the compound locomotive and in the development, particularly, of the American designs, the principal characteristics of which have been in regard to cylinders—one high-pressure and one low-pressure cylinder.

It seems to me that it would be impossible to get the same pressure on the crosshead connected with each cylinder, however accurately the valve gearing might be adjusted, and that the unequal pressure would be more likely to result in crystallization of the axles of the driving wheel, and that in a less time than in an ordinary two-cylinder engine.

This unequal pulling and pushing strain will result also in uneven wear of the connecting rod and driving box brasses and make the engine badly out of line.

The compound engine seems to be a move in the right direction; but are the two cylinders of different size, one on each side, the best arrangement?

W. WALLACE CHRISTIE.

[With regard to the crystallization of the driving axles, we suppose our correspondent refers to the effect produced by the wide variation in turning moment of the crank. If so, then one can but say that the turning moment is more uniform with the compound than with the simple engine, principally because the cut-offs are longer and there is less difference between the terminal and initial pressures. Being more uniform, the effect on the axles, be it crystallization or fatigue, would be less. With regard to the uniformity of pressure on the crank pin, there is always greater evenness of such pressure with the longer than with the shorter cut-off. Now, because for the same work the cut-off in the compound locomotive is in general longer than in the simple locomotive, it is reasonable to suppose that the crank-pin pressures will be more uniform in the compound. Regarding this, we shall soon have more that is conclusive to give in these columns.—EDITOR RAILROAD GAZETTE.]

The Intercepting Valve—Replies to "A Friend of the Compound."

63 *Queen Victoria Street,*
LONDON, ENG., April 25, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In a letter which appears in your issue of April 11, signed "A Friend of the Compound," some inquiries are made as to the requirements and performances of the intercepting valve on compound engines. The foot-note you have added answers several of the queries, but, perhaps, the following may be of interest:

The object of the intercepting valve is to close the communication between the high and low pressure cylinders at starting and preventing high pressure steam admitted to the low pressure cylinder, getting back and blocking the piston of high pressure cylinder, thus allowing a compound engine to start with boiler steam in both cylinders and without back pressure on high pressure piston, as in a non-compound engine.

A compound engine not having an intercepting valve has been proved unable to start with a heavy train properly coupled up, or on an incline with slack couplings. Without an intercepting valve a compound locomotive is not reliable for starting in cases of emergency.

The intercepting valve, when the engine has started, opens automatically. The high-pressure cylinder having received the required amount of steam for expansion in the low-pressure cylinder, the engine has its full power. A heavy American slack-coupled freight-train can be picked up with far less steam than with a non-compound engine.

TAITE & CARLTON.

HANOVER, April 24, 1890.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the last number of your valuable paper, page 243 [April 11], "A Friend of the Compound" asks for the reason why the intercepting valve of the Michigan Central compound engine almost opens (not closes) before a half revolution is made by the drivers. This question is easy to settle. If the drawing of that valve published on page 73 of the *Railroad Gazette* [Jan. 31] is examined it will be seen that when the first steam from the high-pressure cylinder is exhausted into the receiver the small pressure caused by this exhaust works on the back side of the intercepting valve or piston and opens it easily, because there is only the small amount of friction against this motion. Now this first exhaust goes on within the first half revolution, and therefore the valve opens within the same time.

This manner of working the intercepting valve is certainly not good for a quick and sure starting, because the first exhaust gives only a small pressure in the receiver, so that the pressure in the low-pressure valve chest will be much lessened by the opening of the valve and shutting off the live steam, causing an insufficient tractive force by the low-pressure piston and shaking motion of the engine and train. Our intercepting valves only open when, after two or three exhausts' the pressure in the receiver has become equal to the pressure of the live steam working the low-pressure piston, say 40 to 50 per cent. of the pressure in the high-pressure valve chest. Therefore, these valves only open after 1 to 1½ revolutions, when the whole train is in motion.

Experience has shown that it is not well to have too little pressure in the receiver after starting, because three or four revolutions are necessary to get the proper running pressure. Too much pressure on the low-pressure side when the valve opens, is of no harm, because it is exhausted down to the proper working pressure by one or two exhausts.

The insufficient working of the intercepting valve on the Michigan Central compound, and the heavy and costly construction of this valve, also the defects experienced in the working of the gear of this engine (too high compression on high pressure cylinder, and much resistance at high speeds) could have been avoided easily if the constructors had asked me or another member of our company for the proper dimensions and proportions of these parts, all these questions having been settled here long ago. Our compounds are said to run exceedingly easily at high speeds, better than others of the same power, this being caused by the greater travel of the valves, and consequently wider opening of the ports on each cylinder.

VON BORRIES.

[The first of the above letters is from the agents of the Worsdell, Von Borries & Lapage system of compounding locomotives. Our readers will remember that the query of "A Friend of the Compound" was regarding the value of the intercepting valve, on American trains, if it closed long before the slack was taken up in such trains at starting, as has been observed to be the case with the Michigan Central compound locomotive. This query was referred to Taite & Carlton, as being representatives of several well-known designs of intercepting valves. Their reply does not meet the point made by "A Friend of the Compound," and reiterates what we published from a circular prepared by them in the *Railroad Gazette*, April 11, 1890. What was called for by our correspondent in his query was an explanation of the value of an intercepting valve when that valve closed before the slack was taken up.

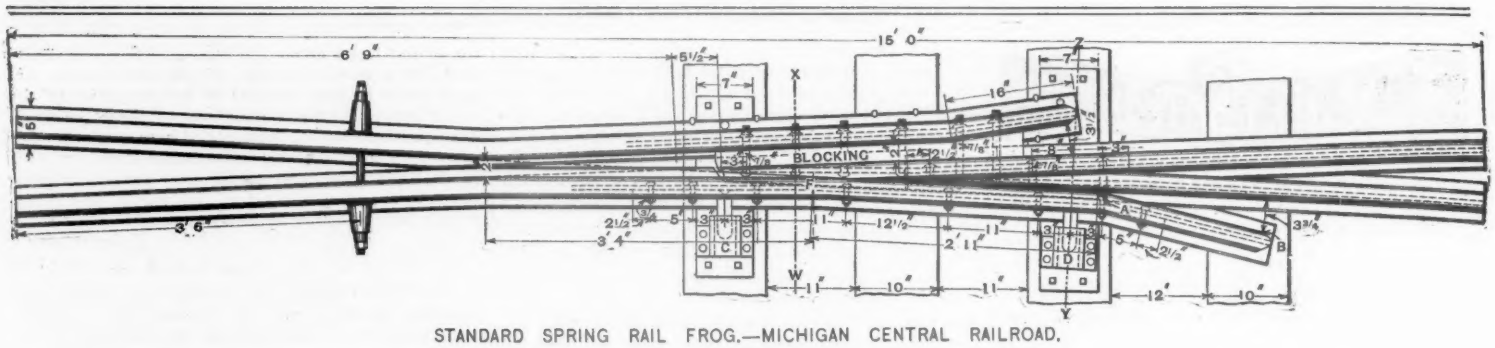
In the second communication, that from Mr. Von Borries, the point made by "A Friend of the Compound" is better appreciated and is to some extent met by saying that the incercepting valve ought not to close (or open, according to the method of reckoning) at the first exhaust, but should continue as before the engine started until the wheels have made 1 to 1½ revolutions, or several exhausts. But he does not mention the effect of the impact of the exhaust steam at the time of the first exhaust from the high pressure cylinder on the intercepting valve, which is probably of quite as much importance as the normal pressure of that steam. If our memory serves us correctly, it is this impact which has caused the closing action referred to by "A Friend of the Compound" to take place with several of the European intercepting valves in service. But, be this as it may, and whatever be the actual performance of the intercepting valve as now in use, we do not think it wise on the basis of limited knowledge now available regarding the action of such valves in service to give an opinion as to the relative merits of the various designs. It is sufficient perhaps now to say that the intercepting valve has a definite function to perform, which is to restrain the steam pressure that is on the steam side of the low pressure piston from reaching the exhaust side of the high pressure piston, in order to increase the power of the cylinders at starting, that being the time when the locomotive is evidently supposed by some designers of such valves to get its full load. Now, if such an increase of power comes at the time needed, then the device is performing its intended function. If not, then it is of more or less value, according to the closeness with which the time of maximum cylinder power approximates to the time of maximum train resistance. The conditions will necessarily vary as the character of the train changes; with a close coupled vestibule they will be different from those with a loose coupled freight train.—EDITOR RAILROAD GAZETTE.]

Spring Rail Frogs.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Of late there has been very little or nothing in your columns in regard to spring rail frogs aside from the Road Masters' Convention and committee reports. It is understood this way that the Pennsylvania Railroad is not putting any more in, and one of the larger Northwestern systems has had its own opinion in regard to their use confirmed by this action of the Pennsylvania Railroad, and has ordered all its spring rail frogs out, although there has been no accident from their use and their economy is well established. On the other hand, roads like the Michigan Central are putting them in and raise no question of their safety. It would be interesting to have this question worked up and the experience of those in charge of track given. SUPERINTENDENT.

Since we published, last February, the fact that the Pennsylvania was taking out all spring rail frogs as fast as they wore out, we have received a number of letters like the above, and this change in policy has naturally attracted much attention. The advantages of spring rail frogs have come to be pretty generally recognized. They are undoubtedly more durable and easier on rolling stock than rigid frogs, and the only serious question has been as to their safety; but after discussion extending over some years, the Superintendents' Association and the Roadmasters' Association have united in recommending them for all main line track. The action of a great road, well known for its good track, will doubtless disturb the opinion of many who had settled



STANDARD SPRING RAIL FROG.—MICHIGAN CENTRAL RAILROAD.

down to spring rail frogs, and the result may, eventually, be to bring the matter up again in the associations. The reasons of the Pennsylvania for going back to the rigid frog are given briefly by Mr. J. T. Richards, Assistant Chief Engineer, Pennsylvania Railroad Co., as follows:

"The facts were, that while the spring rail frogs rode very nicely and wore longer than the stiff rail frogs, yet we had some very bad accidents, which proved that they were such an element of danger that it would not do for our company, under any circumstances, to keep them in use. The main cause was in the loose rail breaking or rolling out of place by a sharp flange running in the trail direction of the frog. This rail is not nearly as strong as a fixed rail, and it is our practice to eliminate every element of danger which we can, even at the expense of using a frog of shorter life which we think is absolutely safe."

From other sources we learn that the spring rail frog, although it has been used on the Pennsylvania for more than a decade, has never been entirely satisfactory. The breakages of the loose rail have been frequent, and there were many derailments due to the rail being pushed aside by false flanges, narrow treads, etc. Breakages were more frequent in winter than in the summer, because of the greater rigidity of the winter roadbed. The decision has been arrived at reluctantly, because it is admitted that, baring breakages, the spring frog would wear two or three times as long as a stiff frog; but eventually the greatest weight has been given to the consideration of safety, and the decision of the engineers of maintenance of way on the main line of the Pennsylvania is, we understand, unanimous in favor of going back to the rigid frog.

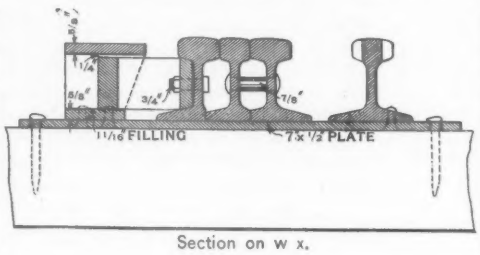
A correspondent who is not connected with the Pennsylvania, but is in a position to get pretty accurate information, says that "now that requisitions for spring rail frogs are no longer honored, the supervisors keep them in as long as they can, and the renewals of that sort are few. But as the Pennsylvania Railroad is relaying main track with 85-lb. rail, it happens that good spring frogs of 70-lb. rail are taken out, and the frogs of 85-lb. rail which replace them are, of course, stiff frogs, much to the grief of the supervisors, because many of such stiff frogs wear out in four to seven weeks in places where spring frogs served four to six years.

"When I say 'worn out' I mean the rails opposite to the point where the tread of the wheels bangs the wing rails. The fastening by which the frog is bound together does not fail, and is intact in many cases, but the rails are worn down an inch in the one place. I don't think engineers of other roads are accepting the Pennsylvania idea about spring rail frogs, although they are recognizing that some frogs may be safe beyond doubt, while others may be safe with some doubts."

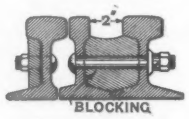
Mr. J. D. Hawks, Chief Engineer Michigan Central, sends a drawing of his spring rail frog for 80-lb. rail, which is reproduced on this page. Concerning it, he says: "There is no one point about a track that needs more attention than a frog. Accidents have happened, and will continue to happen, on rigid frogs and on spring rail frogs. The spring rail frog, however, is so much more lasting, so much easier on rolling stock, so much more comfortable for passengers and the cause of so much smaller number of *remote* accidents, that it will continue to be used on main lines in preference to the rigid frog. Accidents caused by rigid frogs do not always happen at the frogs themselves. Broken wheels or broken flanges may not develop for miles after leaving the frog that caused them.

"There are some points, however, about a spring frog that need very close attention, and unless such attention can be given the use of the spring rail frog had better be abandoned. You will notice on our drawing a bend at *A* and a straight line from *A* to *B*, which is entirely different from the usual practice of frog builders. I found that with the old construction flanges of wheels would mount the spring rail when trains were coming out of a side track, and would run along the top of the rail and finally drop in on the right side in a majority of cases. In a few cases, however, the flanges dropped on the wrong side of the rail and, of course, the wheel was off the track. Since making the bend as shown on the blue print we have had no trouble from this cause.

"You will notice also that a stop is put opposite the point at *C*. This stop must be so arranged as to work with the stop at *D*. Unless this matter is very closely attended to, the frog manufacturers (whether the railroad companies themselves or outside manufacturers) are inclined to be careless and get the stops in such a



Section on w x.



Section on y z.

position that the spring rail will bring up against the stop *D*, while it lacks an inch or so of bringing up against the stop *C*. This allows the most common of all accidents at spring rail frogs to occur; that is, it allows the false flange of a grooved driving wheel to crowd the spring rail out of position far enough so as to have the wheel drop off from the point of the frog and onto the ground, the stop *C* not holding the spring rail in position sufficiently firmly to compel the false flange to jump up on top of the spring rail and so go along where it belongs, on top of the rail. I think of all accidents to spring rail frogs this is the most common. I have never known it to occur, however, on a frog with two stops arranged as on the plan, where the two stops were properly placed as regards the point of the frog and as regards proper flange-way when the spring rail was open.

"With proper attention to the details I have mentioned, I consider the spring rail frog as being safer, cheaper and more comfortable than any rigid frog ever made. Without attention to these details, I consider the spring rail frog an unsafe thing to use; but without attention to details a rigid frog is equally unsafe.

"There are a number of ways of arranging to accomplish the purposes above described as being necessary for the successful building and using of a spring frog; my blue print shows only one of the ways, and one which I think successful."

The Freezing Process in Shaft Sinking.

BY DANIEL E. MORAN, C. E.

The freezing process for making excavations in water-bearing material was employed for the first time in the United States at Iron Mountain, Mich., in sinking a shaft for the Chapin Mining Co. The Chapin mine is well known as the largest producer of Bessemer ore in the Menominee District. The strike of the main ore body is, roughly speaking, at right angles to the axis of the valley in which the workings are located. The outcrop is only slightly covered with soil on the side-hills, but in the swampy centre of the valley it is heavily overlaid with drift. The first opening, a slope following the dip of the ore, was made near the original discovery, high up on the side-hill. Subsequently shafts were sunk through the overlying rock to the ore at points further down the hill. As the workings were pushed out from these shafts, under the swamp, and toward the centre of the valley, new shafts were needed for ventilation, to shorten underground and surface haulage, and also to enable the mine to be drained at the point where the lift of the pumps would be at a minimum. For all these purposes, the most desirable location for a shaft was the centre of the valley. But the difficulty of sinking increased as the location of the shaft left the hillside and entered the swampy bottom lands.

The material overlying the rock in the central part of the valley is largely fine sand, having a little clay mixed with it. In the presence of water this material is very unstable; as the miners put it, "it will run where water will," and it is very destructive to pumps. Through this sand occur layers of gravel and boulders. Many of the boulders are of large size, and so closely packed as to give the effect of having been laid by a mason.

The mining company made several attempts to get a shaft down through this swamp, but failed entirely, only demonstrating the difficult nature of the undertaking. Finally, in 1887, a contract was entered into with the Poetsch-Scoysmith Freezing Co., the owners of the American patents covering the freezing process, by which the latter agreed to sink a shaft of circular section to the ledge at a point where the overlying material was about 100 ft. thick.

The location selected for the shaft was in the centre of the valley, close by the small stream which carries the surface drainage of the small tributary water-shed. It was, therefore, at the lowest level possible. In reference to the ore-body, it was located so as to go down in the country rock on the foot-wall side, the experience of the mining company having been that shafts going through the hanging-wall are short-lived. Trial borings showed that the drift overlying the rock was 95 ft. thick at the centre of the shaft, and that the water level stood to within 10 ft. of its surface. This water level was below the normal, having been reduced by pumping operations at neighboring shafts, and subsequently varied considerably from the same cause.

Preliminary Work.—The original design was for a shaft circular in section, with a lining of cast-iron plates.* On this basis it was decided to sink 26 8-in. pipes vertically through the drift to the ledge, so arranged in plan as to be equally spaced around the circumference of a circle of 29 ft. diameter. The pipes had to be nearly vertical, absolutely tight under pressure, and their lower ends had to be securely closed. It was decided to be impracticable to sink these pipes independently and have them fulfil the requirements, so 10-in. pipes were sunk first, to serve as temporary casings, inside of which the 8-in. pipes were put into position with safety.

As soon as a 10-in. pipe was in position, with its lower end some inches into the ledge, a line of 8-in. pipe was lowered into it, the first section having previously had its lower end closed by welding in an iron plug. The 8-in. pipe was made of ⅜-in. iron plate, the sections going together with male and female taper screws cut out of the thickness of the pipe, making a flush joint inside and out. As each joint was made, it was tested under heavy water-pressure, and if tight the line was lowered the length of a section, and the next joint made and tested; and so on until the entire length was completed. Then the 10-in. casing was drawn, with use of water-jet, leaving the 8-in. pipe in contact with the soil. In this way, 26 lines of 8-in. pipe, varying in length from 87 to 97 ft., were put in position. This part of the work was one of great difficulty owing to the number and size of the boulders encountered. Under the terms of the contract it was done by the Chapin Mining Co., and upon its completion the work was turned over to the Freezing Co. by whom all subsequent operations were conducted.

Refrigerating Machine and Connections.—A Linde ice machine (ammonia compression type), of 50 tons refrigerating capacity,† built by F. W. Wolf, of Chicago, was put in position close by the circle of pipes. The motive power was furnished by an Allis-Corliss engine, connected with the ammonia compressor of the refrigerating machine by a shaft carrying a heavy fly-wheel. The engine was 18" x 42", used compressed air ‡ at 60 pounds pressure, and developed 55 H. P. at 60 R. P. M.

The ammonia compressor was of simple design and had ample bearing surfaces, so that a seven months' run was completed without any shut down for repairs or hot bearings. It is much to be regretted that no test was made of the efficiency or capacity of the machine under the conditions existing at Iron Mountain, as it would have been of great interest to know the total number of heat units taken from the soil to compare with calculations based on the observed effects.

The brine used as vehicle between the refrigerating machine and the soil was a solution of the impure $CaCl_2$ of commerce. According to an analysis furnished by the manufacturers, the "chloride of calcium" contains:

	Per cent.
$CaCl_2$	60
$NaCl$	5
$MgCl$	15
H_2O	20

A saturated solution of $CaCl_2$ is said to have a freezing point of — 40 degrees Cent. (or Fahr.). No trouble from freezing of the brine was experienced at

*This was subsequently changed by the Chapin Mining Co. to a timber-lined shaft of rectangular section.

† One ton, refrigerating capacity, is equivalent to the cooling effect of one ton of melting ice, or 2,0 0 pounds × latent heat ice = 2,000 × 142 + = 284,000 + British thermal units.

‡ The power used at the Chapin mine is furnished by an air compressing plant at the Quinnessec Falls of the Menominee River, distant about three miles. For a brief description of this interesting plant, said to be the largest of its kind, see catalogue of the Rand Drill Co.

Fig. 5.

SHAFT-SINKING AT THE CHAPIN MINE—BASE OF WALL OF FROZEN QUICKSAND.

(Engraved from a flash-light photograph, taken at midnight, 90 ft. below surface of ground. The miner's candlestick marks the junction of the ledge with the frozen quicksand.)

the temperatures used at Iron Mountain, except when the specific gravity of the solution was below 1.200. The cold brine was pumped through a set of distributing pipes and regulating valves to the ground pipes. After traversing the ground pipes it returned through a set of collecting pipes, similar in arrangement to the distributing pipes, to the refrigerating machine. The circulation of the brine in the ground pipes was effected as follows (see fig. 1).

Each 8-in. ground pipe was capped with a 8″ to 4″ reducing coupling, and this connected by a short 4-in. nipple, with a 4″ × 2″ × 2″ tee. The 2-in. side opening of this tee connected with the return system. Through the 2-in. top opening ran a "long threaded" 2-in. nipple with jamb nut above. This nipple extended some 18 in. below the 4″ × 2″ × 2″ tee, and was there connected by a 1½″ × 2″ reducing coupling with a line of 1½-in. pipe extending down the centre line of the ground pipe to within a few inches of the bottom. The upper end of the 2-in. "long threaded" nipple was capped by a 2″ × 2″ × 2″ tee, from the side opening of which connection was made with the distributing system. The brine entered through the top connection, passed down through the line of 1½-in. pipe to the bottom of the ground pipe, returning through the annular space between the 1½-in. pipe and the 8-in. pipe, and going out through the lower 2-in. side connection.

The circulation of the brine through each pipe was adjusted by means of regulating valves, V and V_2, Plate I., so as to bring the temperature of the return streams as nearly equal as possible. This method of regulation was designed to render the effect of each pipe equal in the event of the conditions affecting the pipes being different. The velocity of the brine in the inner down-flow pipes was 2 ft. per second, the brine changing every 25 minutes in the ground pipes.

The connecting pipes above ground were not protected in any way, so that immediately after starting the condensation of moisture from the atmosphere coated the pipes and connections with a snowlike ice, which increased in thickness until some very picturesque effects were produced. The coating, moreover, served as a cheap and effective lagging.

The effect of starting the ice machine and the circulation of brine was immediately apparent. The ground froze around each pipe, forming cylinders (or, as they were afterward found to be, cones), which increased in diameter until adjacent cylinders intersected, thereby forming a continuous circular wall extending from the surface of the ground to the underlying rock, and constituting a coffer-dam inclosing the proposed shaft. The rate of freezing around the shaft was substantially uniform.

On excavating down to and below the water level, the wall was found to be complete and tight under pressure, and no water at any time came through the frozen wall, although, as subsequently to be described, water did find its way through the rock ledge, and finally between the ledge and the base of the frozen wall. As the excavation progressed, the diameter of the core of unfrozen material in the centre of the shaft decreased. This was due primarily to the difference in elapsed time, but also in some degree to an effect of the method of circulation. The brine being introduced through small pipes in the centre of the 8-in. ground pipes, it reached the bottom at nearly its initial temperature, so that the lowest temperature, and consequently the greatest freezing effect was at the bottom of the shaft. With a nearly constant difference of only 1 degree Cent. between the top and bottom of the pipes, there was a marked difference in the distance frozen, as determined at the completion of the work by means of a small trial shaft sunk on the outside of the wall, which showed a nearly uniform batir of about 1 in 15. It was not determined, however, that this increased thickness was due to this cause alone.

It is apparent that the difference in temperature between top and bottom of the pipes, and probably the extent of this coning, could be regulated by varying the rate of circulation. There is a theoretical advantage in the cone form, as the pressure on the frozen wall increases directly with the depth. On the other hand, the difficulty of excavation increases as the wall thickens and the unfrozen core diminishes in diameter.

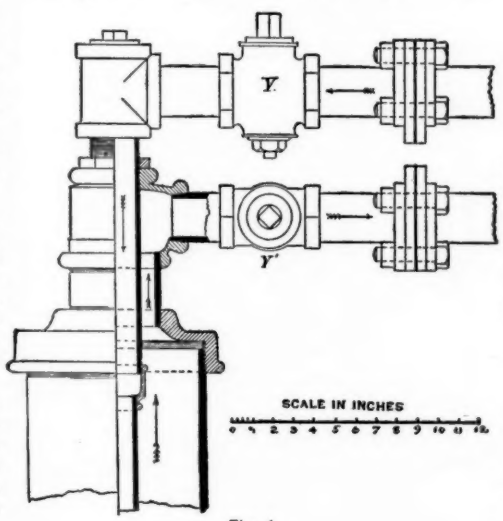


Fig. 1.

The rate of freezing varied in different materials, according to the amount of water contained. Several careful experiments gave 17 per cent. of water in the fine sand. Where gravel or boulders were imbedded in the sand, this percentage was largely decreased and the distance frozen was correspondingly greater.

The effect of the water can be seen from the following approximate calculation of the number of heat units required to reduce the temperature of one cubic yard of saturated quicksand from 10° Cent. (50° F.) to — 15° Cent. (5° F.), limits which agree with practice for material in close proximity to the freezing pipes.

		Pounds.
One cubic yard of saturated sand, as determined by experiment, weighs		3,360
Weight of water, 17 per cent		571
Weight of sand, 83 per cent		2,789
Specific heat of water	1.0	
Specific heat of sand	0.2	
Specific heat of ice	0.5	
Latent heat of ice	80 Cent. lb. h. u.	

Heat units abstracted from the sand:

Weight × sp. ht. × range of temperature = Cent. lb. h. u.

2,789 × 0.2 × [10 — (— 15) = 25] = 13,945

Heat units abstracted from contained water:

1. To reduce to 0° Cent.

Weight × sp. ht. × range of temperature = Cent. lb. h. u.

571 × 1.0 × 10 = 5,710

2. To freeze.

Weight × latent heat

571 × 80 = 45,680

3. To reduce to — 15° Cent.

Weight × sp. ht. × range of temperature

571 × 0.5 × 15 = 4,282

Total 55,672

SUMMARY.

Heat units in sand = 79.97 per cent	13,945
Heat units in contained water = 20.03 per cent	55,672
Total	69,617

Or, the water in the sand consumes nearly 80 per cent. of the refrigerating effect. If, then, the sand be replaced in part by material not containing water, the work of freezing will be proportionately reduced.

The above figures do not represent the amount of freezing effect required to produce a cubic yard of frozen wall in practice. Besides the loss due to radiation above ground, the following causes produce greater or less losses:

1. Conduction from subterranean sources of heat.
2. Conduction from surface.
3. Flow of subsoil water.

It must, moreover, be remembered that the work of refrigeration, as distinguished from the work of freezing, includes the cooling of a quantity of material beyond the limits of the frozen wall.

Characteristics of Frozen Quicksand.—The character and strength of frozen sand will probably be found to vary with different sands. The sand at Iron Mountain was very fine, and to the eye and touch it seemed to be composed of grains of fairly uniform size, without sharp edges. Under a low power microscope, however, the size of the grains is seen to vary from a maximum of about $\frac{1}{64}$ of an inch for the greatest dimension down to what still appears under the glass to be a mere speck. The angles of the grains appear as sharp as in ordinary building sand, but the grains are not clean and there is a slight tendency to cake. A sample taken from the centre of a lump, as excavated, and tested for size of grain gave the following results:

One hundred grammes were weighed, and of this

1.8	grammes were stopped by an				80-mesh screen.		
2.0	"	"	"	"	100	"	"
26.6	"	"	"	"	190	"	"
68.7	"	passed			190	"	"
.9	"	were lost.					

100.0 total; or nearly 70 per cent. passed a 190-mesh screen.

Tests were made during the progress of the work to

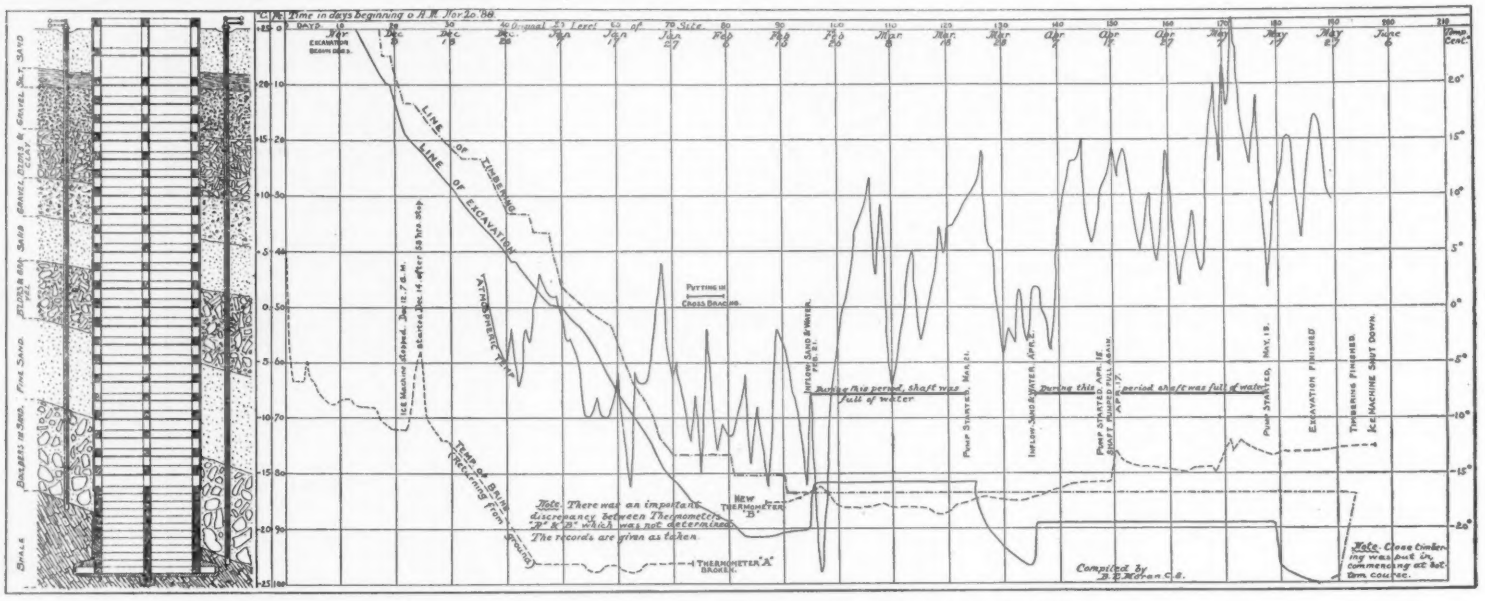

Time in days beginning 0 A.M. Nov 20. 88
LINE OF TUBBING
LINE OF EXCAVATION
ATMOSPHERIC TEMP
TEMP OF BRINE returning from bottom
Note. There was an important discrepancy between Thermometers "A" & "B" which was not determined. The records are given as taken
NEW THERMOMETER "B"
THERMOMETER "A" BROKEN.
PUTTING IN CROSS BRACING.
Compiled by D. E. Moran C.E.
Note. Close timbering was put in commencing at bot. 6m. course.

FIG. 2.—SHAFT-SINKING AT THE CHAPIN MINE—PROGRESS DIAGRAM.

determine the strength of this material when frozen. Briquette molds were filled with saturated sand and frozen, the resulting briquette being kept at a low temperature until tested. An ordinary Fairbanks cement tester was used for both tensile and compressive tests. The compressive tests were limited by the size of the machine to one-inch cubes, which were formed roughly by the same method used for the tensile strength briquettes. The tests were made in a cold room, but the temperature of the test pieces was not determined, nor is it known what effect, if any, the degree of cold below 0 degree Cent., has on the strength of the material. The results were as follows:

	Tensile Strength.
Average of 4 tests	431 lbs. per sq. in.
Maximum result	491 " " " "

	Compressive Strength.
Average of 8 tests	575 lbs. per sq. in.
Maximum	880 " " " "

Frozen quicksand can be regarded as a mortar in which the cementing material is ice, and, as in a cement mortar, the strength will probably be found to depend on the quality of the sand and the presence of sufficient cementing material as well as on the strength of the cement. When unmixed with gravel frozen quicksand looks like a fine-grained sandstone; it is perfectly homogeneous, breaks with a tendency to conchoidal fracture, and is as hard to work as a stone of similar character. When the sand contains gravel or boulders the difficulty of working is more than doubled, as the gravel increases the tenacity of the mass and continually dulls the pick-points and "moils" of the miners. The strength with which the quicksand adheres to the stone is shown by the line of fracture in such material. There seems to be no tendency for the rounded boulders to pull out of the quicksand, but rather for the break to follow. Fig. 5 shows the rock ledge and the base of the frozen wall, the line of junction between the two being marked at one point by the miner's candlestick. The upper part of the engraving shows pieces of rock detached from the ledge embedded in the quicksand. The vertical dark lines on the surface of the wall of quicksand are tool marks

Excavation.—The progress of the excavation and timbering is shown by the accompanying diagram (fig. 2), which also shows the variations in temperature of the atmosphere, and of the brine returning from the ground. On the fifteenth day after starting the ice machine excavation was begun with two gangs, working ten hours each. On the twenty-third day the supply of compressed air for the engine of the ice machine failed, and for sixty hours the ice machine was idle while a connection to an adjacent steam-boiler was being made.

During this time excavation was suspended, and the temperature of the brine rose. Excavation and timbering was resumed on the twenty-eighth day, and continued without interruption until the seventy-fourth day, when cross-timbering was begun. This occupied four days, during which time but little excavation was done.

At this time, and for ten days previously, a small amount of water found its way into the shaft, coming up through the unfrozen core. As the excavation progressed this increased in amount, so that a small pump was placed to keep the shaft dry. At first no sand came with the water, and no difficulty was occasioned, but on the 93d day the water increased in quantity and sand began to come with it. Additional pumps were put in position, but as the flow of sand greatly increased, the shaft was pumped full of water to equalize the pressures inside and out and thereby prevent any further flow, until the leak could be frozen off.

The reason (as was subsequently demonstrated) for the flow of water and sand is this: As the excavation progressed, the unbalanced water-pressure outside caused a small amount of water to pass through seams in the ledge into the unfrozen centre of the shaft. This flow of comparatively warm water gradually heated up the partially frozen ledge and opened new passages, increasing the flow and ultimately thawing the base of the frozen wall. A direct passage was then afforded between the frozen wall and the ledge, through which came sand and water in increasing quantities. The opening enlarged constantly, rendering a shut-down imperative.

In order to close this leak expeditiously an additional freezing-pipe was put in place inside of the shaft and near the location of the leak. The pipe was jetted down into position, and brine circulated through it continuously. On the one hundred and twenty-fifth day the shaft was unwatered, and excavation begun again, only a small quantity of water coming in. The sand which had come in with the water was speedily removed together with tons of ice which had formed on the walls of the shaft.

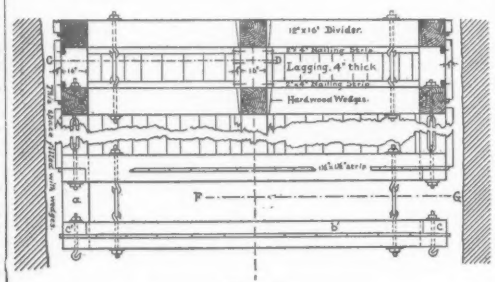


Fig. 3.

Elevation and Section.

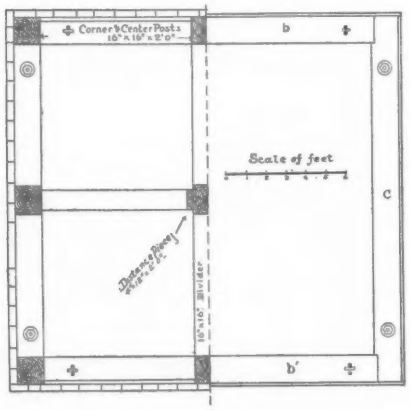


Fig. 4.

Sectional Plan on Line C. D. Plan on Line F. G.

LINING OF SHAFT.

Sinking was then resumed with three shifts working eight hours, and good progress was made until the 135th day, when the flow of water through the old leak increased rapidly, driving the men up and necessitating a second shut down. The sump was at that time 7 or 8 ft. in the rock, consequently below the leak which was at the line of junction between the rock and the sand.

Before flooding the shaft a coil of pipes was suspended against the wall exactly at the leak and pipe connections were carried from the coil to the surface and connected there with the circulation of brine. In this way the freezing action was concentrated at the known point of weakness.

Then followed a short period of freezing and trial pumping until May 15 (the 178th day) when the shaft was pumped out for the last time. The leak was found to be effectually closed, and the excavation was completed without further difficulty.

Lining.—The timbering was put in position by the regular gang of miners after all the framing had been done on the surface. The first and uppermost set of timbers was hung from heavy sticks which extended along two opposite sides of the shaft, and which were sufficiently long to get a solid bearing at each end 6 ft. back from the edge of the excavation.

As the timbering progressed, each set was hung by links and screw-bolts from the one immediately over it. Only the main timbers and the 4-in. lagging were put in position at first, the cross-timbers (or "dividers") not being put in until the timbering was nearly completed, and then in reversed order, beginning at the bottom and working up. The operation of putting in a set was as follows: The set having been framed, assembled and marked above ground, the first pieces sent down were the two opposite ones, *b* and *b'*, Figs. 3 and 4, which were to be hung from the set above, and support in turn the other two pieces, *c'* and *c'*, by their halved ends. Pieces *b* and *b'* being in position, hanging loosely by the links and screw-bolts, pieces *c* and *c'* were put in place without special care as to exact position. The four corner-pieces ("studdles") came next, and then the nuts on the screw-bolts were sufficiently tightened to steady the whole. All the pieces were then carefully adjusted, wedges being put in between the timbers and the frozen wall, and tightened or loosened until the set was square and in line. The nuts were then tightened finally, and the corner posts spiked.

The lagging was then sent down, sawed to proper lengths, and was put in place, commencing at the corner posts. The 1½-in. by 1½-in. strip, spiked on outside of each timber, served to support each piece of lagging temporarily, while heavy wooden wedges were driven in the space between it and the frozen wall. It was considered desirable to fill this space as fully as possible, and where the material was especially fine hay was also packed in with the idea that it would, when wet, swell and fill the cracks between the 4-in. lagging pieces, and prevent any sand from entering. The only difficulty was to get the last piece in position, and careful fitting was necessary to have it go in tight.

When the lagging was completed, the wedges, driven in tightly all around, made everything solid and immovable. Subsequently, however, 2 in. by 4 in. pieces were spiked to the lagging and to the timbers, and the joints between the pieces of lagging were waterproofed by strips of tar paper dipped in hot pitch and held in place by battens.

The details of the timbering are shown in figs. 3 and 4. The timbering followed the excavation closely chiefly to save the trouble of scaffolding. The last 15 ft. of the shaft was close-timber from the bottom up, as will be more fully described hereafter.

The solid, rock-like walls of the excavation enabled the work of lining the shaft to be done with extreme precision, so that the finished shaft was nowhere more than a quarter of an inch out of truth or plumb, which is a degree of accuracy probably unattainable in sand shafts by any other method.

Making the Joint.—The completed excavation carried the shaft into the ledge from 4 to 10 ft. It was necessary to make a tight connection between the ledge and the lining, and to arrange for the support of the timbering from the ledge. This latter was accomplished in the usual manner by running short drifts into the ledge at the centre of each side, and putting in extra long and heavy cross timbers. The joint was made by trenching in the bottom of the shaft for the bottom set of timbers, and carefully grouting the space between the timbers

and the trench. To this bottom course of timbers the next course was fitted and spiked, and the space between it and the ledge filled with cement mortar. The gap between the lowest set of open timbers and the bottom of the shaft was in this way filled in with solid timbering. During this latter part of the work the only water coming into the shaft came directly from the ledge through small crevices, but under such pressure as to make it squirt up 3 or 4 ft. into the air. There was not a trace of sand, and not sufficient water to keep a No. 6 Cameron pump going, the leak which had caused trouble previously having been completely frozen off.

When the timbering was completed, steam was turned into the shaft to thaw all ice on the timber, so as to permit the joints in the lining to be made tight with tarred paper, as before described. Finally, water was pumped in up to the level of the water in the soil, and the shaft left to thaw out. The purpose of filling the shaft with water was to equalize the pressure on the timbering during the thawing, which, it was thought, might bring sudden or unequal strains on the shaft.

At the completion of the work, in order to determine the extent of the freezing, a trial pit was sunk at the outer edge of the wall to a depth of 20 ft. and a steel rod was driven down considerably further. The wall had a batir, as before mentioned, but, assuming the measurement taken at the bottom of the pit to be an average value, the quantity of material frozen at that time was bounded by a cylindrical surface, 54 ft. in diameter and about 100 ft. in depth. This mass of frozen material took a long time to melt, notwithstanding efforts of the mining company to hasten the result. It was not until July 25, or 50 days after shutting down ice machine, that the ice wall gave way sufficiently to permit water to come into shaft. The pressure of the sand on the shaft-lining did not disturb the alignment at all, and the shaft is now being carried down into the rock by the mining company, with ordinary methods.

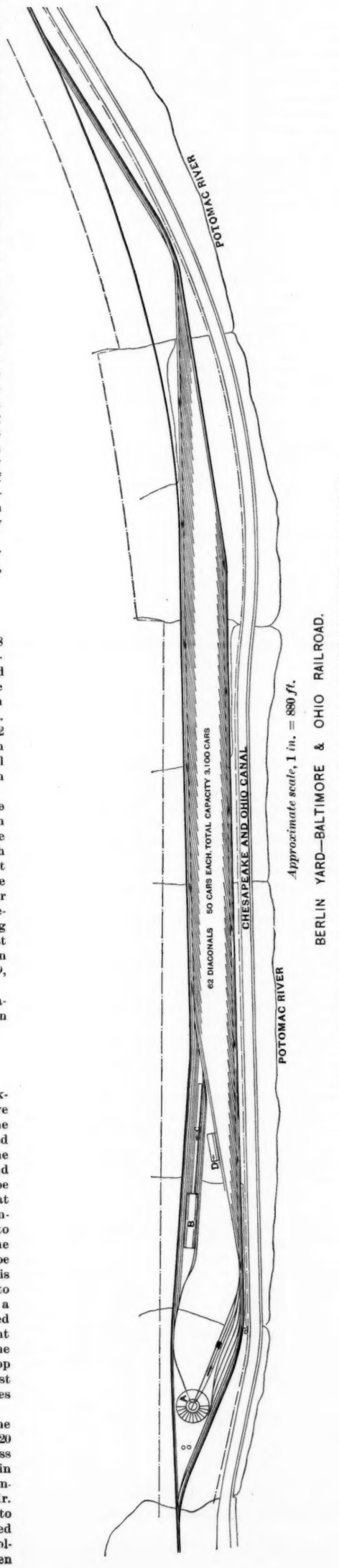
Some additional details will be found in an article by the author in the *School of Mines Quarterly* for April, 1890.

The Berlin Yard of the Baltimore & Ohio.

This yard is now being put in at Brunswick, Md., 78 miles west of Baltimore. It will be seen that it is arranged to give great capacity on a narrow strip of land and while it is convenient to the main line tracks, all the yard work can be carried on without interfering with them. The ground covered by the diagonals is 7,200 ft. by 300 ft., and has standing capacity for 3,100 cars on 62 diagonals. Sixty-three switching engines can work in the yard without getting in each other's way. The total length of the yard between the points where the main tracks diverge is about 8,300 ft.

The plan of the yard is this: The main tracks are spread and the diagonal system constructed between them. On each side, parallel with the main track are two long tracks. The one next the main track on each side is a passing track, and will be kept clear for that purpose. The inner, long track on each side is the base line of the diagonals. Every tenth diagonal crosses over to the long passing track. There is no connection between the main tracks and the yard except by the long passing tracks. There are switches to these at the east and west ends of the yard. The buildings shown are *A*, a roundhouse, *B* and *C*, transfer sheds, and *D*, an ice house.

The general plan was taken from the Northern Pacific yard at North Minneapolis, Minn., but it has been enlarged and somewhat changed.



Approximate scale, 1 in. = 880 ft.

BERLIN YARD—BALTIMORE & OHIO RAILROAD.

NOTE.—In the engraving centre lines only are shown, and the middle portion of the diagonals has been omitted.

The Brooks Locomotive Works.

Those who are interested in modern mechanical workshops may profitably visit the Brooks Locomotive Works at Dunkirk, New York, as there is to be seen the best arranged and in many respects the best equipped locomotive works in operation in this country, and one that is scarcely surpassed abroad in the location and arrangement of buildings and machinery, unless it be by the new shops at Horwich, England. It is true that some works abroad have more tools and a greater number of special machines, but no better equipment is to be seen there in proportion to the output. This is the condition of the Brooks works to-day. What it will be when the contemplated improvements are completed is not difficult to conjecture. In progress, with a view to immediate construction, are a large new foundry, a general storehouse where all goods received and shipped can be delivered directly to the cars of five different lines of railroad, and a considerable addition to the general office. In contemplation is a large erecting shop of the most modern design, to be equipped with the best appliances in the way of travelling cranes, drop tables and special carriers.

It is stated that these works have not been behind the contract date of delivery for a locomotive in the last 20 years. The late Mr. Brooks used to say that promptness in delivery was of more value to a locomotive builder in the eyes of a railroad manager than any feature of construction. But this was not the only good maxim of Mr. Brooks, for good workmanship is not sacrificed to prompt delivery, and no better proof of this is needed than can be had from an inspection of the methods followed at the works. In the office and shops can be seen marks of a plan that had as its purpose the eventual construction of a great workshop equipped with the most improved tools of all kinds, the old being replaced continually with new, and the building up of a business firm with such a reputation for reliability and good design as would make it easy to get orders and give it a liberal differential when competing with other firms. This was the plan laid early in the locomotive-building career of the founder of this plant, and one that has been followed by the present management since his death. Last year the president of the works traveled through Europe collecting information regarding the latest methods of machine construction, with the result that a considerable number of foreign tools will soon arrive at Dunkirk.

In the erecting shops, which are under the same roof with the machine shops, the work and machinery are so planned as to prevent any interference during the progression from the rough state to the location of the details on the finished locomotive. The lighting is excellent, it being possible to work on nearly all of the tools and all parts of the locomotive without artificial light, even in cloudy days. At present 10 ten-wheelers are under construction for the Wisconsin Central Railroad. In design they are quite similar to the large order given this company by the New York Central road. This design has proved to be very satisfactory on the New York Central and has been accepted in preference to other designs offered in competition. Over each locomotive pit in the erecting shop there is a small crane which travels longitudinally with the locomotive, of sufficient capacity to hoist any of the mountings. A drop pit, operated by hydraulic power, will soon be put in position to facilitate the removal and replacing of the driving wheels.

In the machine shop many special new tools are in operation. Some of them are of foreign make. Among these are a large combined slotting and milling machine, which owing to its universality is in constant use on a variety of work, and a circular saw for cutting off piston rods, guide bars and various parts, is in constant operation. This latter is fed with soda water, and it does its work so well that these parts do not require squaring up in the lathe afterward. Two circular saws for metals have been ordered, and will soon be put in position. They revolve at a high velocity, and are without teeth. Such saws are not in general use in locomotive shops, though, at the Aurora shops of the Burlington road, one designed by the mechanical department of that road is working successfully. One of the most attractive features of the machine shop is a large, admirably-lighted fitting-up room for connecting rods, guides, cross-heads, links and small parts generally. It has a few tools which are incident to such work, but otherwise contains only the horses and benches for erecting and fitting up jobs. This room is the best arranged for this class of work of any we have ever seen.

The tool-room is not as light as the remainder of the shop, but as most of the light comes from the roof it is not difficult to see in good weather. This room is fitted with high-grade tools and special grinders for the cutting tools. All of the machine shop repair work is done in a department by itself, and a separate set of hands are employed therein.

The Free School.—A peculiar feature of this establishment is the free technical school, which was established in 1883 by Mr. Brooks. This school is free in the full sence of the word; no tuition fee is asked, and no outside assistance given. In this school the company makes its own draughtsmen, bosses and experts, and a good many for outside firms also. Although many of the pupils go to other works and into other occupations, enough of them stay to make it well worth while to run the school for all it is worth; and it is worth a good deal to those who know how to run it.

The school accommodates 50 boys, and supplies everything, books, pencils, paper, drawing tools, boards, T squares, and all that a pupil needs, even to an occasional lecture as to his personal habits, and how to care for his eyes. There is a room with modern individual desks, lighted by electric lights, well ventilated and supplied with black-boards, and every convenience to assist good instruction. Adjoining is a library in which are on file mechanical publications to the number of 30 or more; also books on all common mechanical and scientific subjects. These rooms are used for nothing else, and are well patronized. They will be soon enlarged, and then the number of students will be increased. The instruction here given closely approaches that of the ideal manual training school and includes as well instruction in all branches of English studies, and in mathematics as far as trigonometry. There is shop work of 10 hours per day, and also a chemical and mechanical laboratory for testing material, into the actual processes of which the better class of students can pry if they feel inclined, no obstruction being put in the way of legitimate curiosity. The company receives applications from all countries for positions in this school, one of the latest being from Japan, and one of the newest students is a Cuban.

The following are extracts from the printed regulations: "The apprentices will, for convenience, be divided into three classes or sub-divisions. Each class will attend the school two evenings in each week, from seven until nine. We shall expect pupils to present themselves

promptly in the school-room at the hour, clean and cleanly clad, and shall insist upon gentlemanly deportment from each pupil. No applicant will be accepted until a full investigation of his character and elementary education is made. An applicant must be 18 years of age; must make application in his own handwriting through the mail, addressed to our office, and must be prepared to furnish credentials of his character, education and aptitude for mechanical pursuits.

"The term of service for apprentices will be three years. The compensation for the term will be: First year, 7½ cents per hour; second year, 9 cents per hour; third year, 11¼ cents per hour. Ten hours constitute one day's work.

"Apprentices will be required to attend the night school such evenings in the week as may be designated. Tuition and books are furnished free of charge, and attendance in the night school is obligatory upon all apprentices who enter our service."

New Orleans Bridge Projects.

We have received a copy of a pamphlet describing the projected bridge of the New Orleans Terminal Railway & Bridge Co., as designed for that company by Mr. T. C. Clarke. A diagram showing plan and elevation of the proposed bridge is reproduced from that pamphlet.

The company is composed of business men of New Orleans familiar with the commercial interests of the level. As the resistance of gravity is directly as the grade, it could draw on a 7 per cent. grade one-seventh, or 382 tons, if it only had adhesion enough; but as a matter of fact it can only draw 74 tons. But if we give it adhesion by the Abt rack-rail system it can draw 382 tons. We prefer to divide the power into two engines of about 60 tons each, for the reasons previously given. They could draw about 275 tons each, or both together a train of 550 tons. If they depended on the safe load on the drawbars they could only draw 184 tons each, but by the simple and safe plan of dividing the power and putting one engine before and one behind the train we can do as above.

"As a matter of fact it will cost no more to draw cars over the 7 per cent. grades worked by the Abt system than by 2 per cent. grades worked by ordinary engines, when the saving of interest is taken into account. As these trains could follow each other safely at ten minutes' intervals, we could draw over two tracks in two hours' time the whole number of cars which now cross the ferries daily."

A letter from Mr. Hildenbrand, representative in the United States of the Abt system, is also given. It will be observed that Mr. Clarke proposes to work the traffic over his bridge by a rack railroad, and it has been asserted that the Harz rack railroad is used only for tourist traffic. Mr. Hildenbrand's letter will correct this impression, and the list which he gives of Abt rack railroads now in existence will be found of interest.

"What is known as the Harz railroad is the line between Blankenburg and Tanne, owned by the Halberstadt-Blankenburg Railroad Co., and forming a part of the regular German railroad system, over which trains of every description are running. Some are local trains running only between the above-named stations, others are through trains coming from and going to Halberstadt. The Harz railroad, therefore, has the same relation to the main road as, for instance, the Allegheny Valley Railroad has to the Pennsylvania Railroad system.

"The distance between Blankenburg and Tanne is 20 miles, of which a little over 4⅓ miles, divided into 11 separate lengths, mostly with 6 per cent. grades, are supplied with the Abt rack rail. These rack portions do not cause any delay to travel; the trains run through without stopping, the same as if the whole line were an ordinary adhesion road. The locomotives weigh 63 tons, pulling trains of 134 tons on 6 per cent. grades at a speed of 7½ miles per hour. Experimentally, trains were run over these grades at 16 miles per hour without difficulty and without passengers noticing anything different from the usual train motion or noise, but ordinarily the speed does not exceed 7½ miles.

"The road was opened in 1886, and from the official reports I quote the following statistics of traffic:

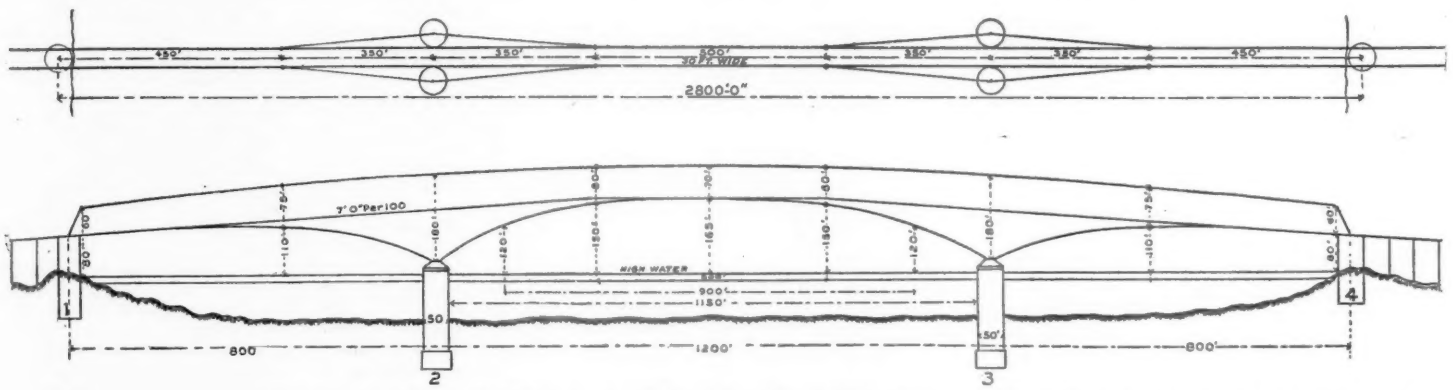
"In 1886, 2,966 trains conveyed 39,300 passengers and 90,000 tons of freight. In 1888, 4,210 trains conveyed 67,500 passengers and 165,000 tons of freight. The principal freight consists of iron, timber, lime, ore, minerals and powder.

"The Harz railroad is not the only line with steep grades and supplied with the Abt rack rail. There are about forty miles of such roads built and in operation. Among others there is the Ostrazac-Serajewo road, crossing the Swan mountains in Bosnia; one in East India crossing the Bolan Pass at the boundary of Afghanistan; one in South America on the Trans-Andes line between Chili and Buenos Ayres, all of them being regular military and commercial roads for all kinds of heavy traffic. The following is a complete list of 'Abt' rack railroads:

	Miles.	Per ct. grade.
Blankenburg-Tanne, Harz Mountains, Germany	4.6	6
Puerto Cabello, Valencia, Venezuela, S. A.	2.3	8
Lehesten, Bavaria, Germany	1.0	8
Oertelsbruch, Thuringia, Germany	⅛	14
Eisenerz, Germany	9.0	7.1
Visp-Zermatt, Switzerland	2.2	12.5
Ostrazac-Serajewo, Bosnia, Austria	12.4	6
Bolan Pass, East India	12	5
Mendoza-Santa Rosa, Trans-Andes Railroad, S. A.	..	..
Mt. Generoso, Italy	5.6	22
Manitou-Pike's Peak, Colo. (in course of construction)	9.0	25

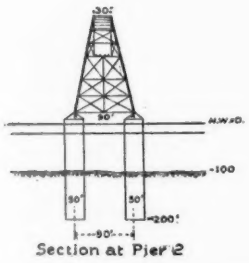
"These last two roads are principally for tourist cars."

The Mayor of New Orleans, in a letter to Senator Vest, Chairman of Senate Sub-committee on Bridges, advocates the plans of the Terminal Railway & Bridge Co., stating briefly the requirements of the towing business. He says that the railroads centering at New Orleans now transfer some 700 cars daily. The object of the railroads in seeking to place the bridge above the city is to connect it with the proposed belt line through the heart of the city, which "the city has positively and finally refused to concede. The city has, however, established a route for a belt line for all the roads which will not only be entirely convenient for them, but will make, with a bridge below the city, a complete terminal system." The mayor concludes that no bridge whatever should be allowed above the city, while one as contemplated below it would be pre-eminently desirable for the commercial interests not only of the railroads but of the Valley of the Mississippi and the city of New Orleans.



OUTLINE PLAN AND ELEVATION OF PROPOSED HIGH LEVEL BRIDGE OVER THE MISSISSIPPI AT NEW ORLEANS.

Mr. T. C. Clarke, Engineer.



city and identified with them, and they have accepted the idea of building the bridge below rather than above the city, for reasons given at some length in the pamphlet. It is considered that, by building a high bridge below the city, the least possible obstruction will be presented to the river business. All of the towing business of the river ends at the city. The tows which are brought down are sometimes over 1,000 ft. long and 262 ft. wide, and the average length of the coal tows is given as 990 ft., with a width of 160 ft. It is held by the advocates of the high bridge scheme that a bridge above the city would necessarily obstruct to a greater or less degree this traffic. It has been decided, therefore, by this company to place its bridge below the city in a straight reach of the river, and to give such head-room that sparred vessels coming from the Gulf will not be interfered with by it.

We cannot better describe the bridge than in the following extract from a letter written by Mr. Clarke to the company:

"The middle span will be 1,200 ft. long and 165 ft. above high water at the centre, and there will be a clear space between the piers of this middle span of 1,150 ft. For a space of 500 ft. this span will be 150 ft., and for 900 ft. it will be 120 ft. above high water. The shore spans will each be 800 ft. long, and the clear headway at the shore piers will be not less than 80 ft. above high water.

"I propose, in the construction of the bridge, to use the Abt system of rack rail, and to adopt a grade of seven per cent. from the centre of the bridge, thus securing comparatively short approaches and a very large saving in cost. The Abt rack rail system is now so thoroughly perfected that the difficulties in surmounting high grades have been very largely reduced. An Abt locomotive can draw as many cars as the size of its boilers and cylinders give it power to do, limited, in the case of the European railroads, by the strength of the drawbars which connect the cars. In your New Orleans bridge I propose to take over the trains by *two* locomotives, one in front and one behind, so that in case of breaking a drawbar the train could not break in two and run away in either direction. By this plan I can draw as many cars as the two locomotives have power to pull.

"A consolidation engine, weighing with loaded tender 75 tons, can draw in addition to itself 2,675 tons on a

Feed-Water Purifiers.

In the East, where comparatively bad water is almost unknown, the desirability of employing some special means for purifying water before it is evaporated in a locomotive boiler is not considered of any great importance; but west of the Ohio River, where *hard* water is the rule, even when obtained from the larger rivers at their low stage, a cheap and effective plan of separating impurities, both in suspension and solution, from the feed water would be hailed as a God-send by hundreds of master mechanics.

Hitherto no one device has been found to give results sufficiently satisfactory and free from drawbacks to warrant its extended application to locomotive engines; but the energy of inventors appears to be none the less vigorous, and two of the most recent devices appear worthy the careful trial of master mechanics, who are anxious to solve this vexed problem.

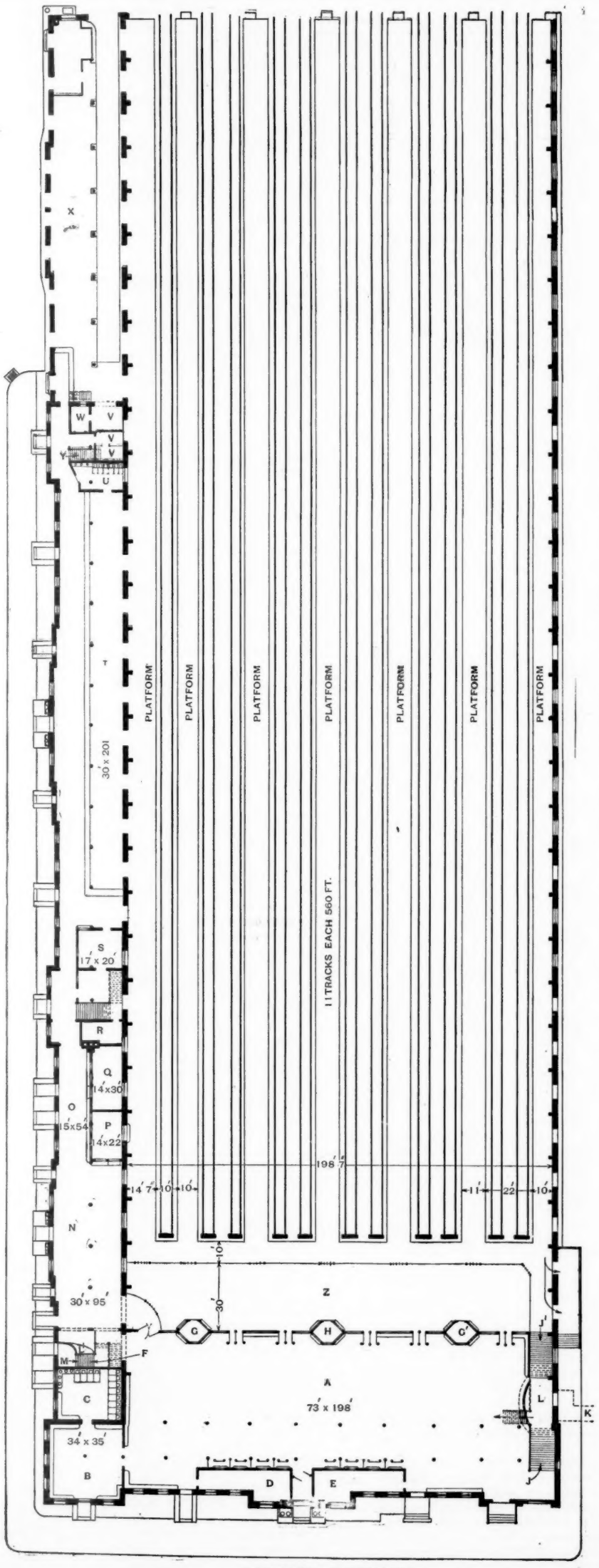
The older one of the two, known as the Hornish mechanical boiler-cleaner, is in use upon several roads in Indiana and Illinois, with the following results: Engines running between points, where the water, owing to the presence of impurities, both in suspension and solution, will not allow of more than 500 to 600 miles being run without washing out, can, after the application of the boiler cleaner, and by periodically blowing off the sediment collected in the settling drums, run 5,000 miles without the least trouble; and it has yet to be proved how much this mileage can be increased without incurring any difficulty. It is stated that the use of this device has not only prevented the deposit of fresh scale, but has loosened and more or less dissolved the old scale. In one case, a stationary boiler, using well water, and which had to be blown off every week, after the application of the cleaner was run continuously for four months without any trouble whatever, and it is now undergoing a test of six months, the master mechanic being confident that it will run that time without having to blow off the boiler.

The device consists of a settling drum, which can be placed either under or over a boiler. One end is connected by a pipe with a skimmer located inside the boiler and near the front end. A circulation is effected by connecting the other end of the drum by a pipe with the leg of the firebox. A third pipe, from the bottom of the drum, serves as a blow off, which is used several times a day, depending upon the nature of the water.

Railroad men are generally of opinion that pipes connected with a locomotive boiler, and liable to fracture in the event of accident or from corrosion, are objectionable, and on this account some might hesitate to employ the device referred to. The results, however, as reported by men using it, are remarkable, and the objectionable features may be by many considered less serious than having to wash out every three or four days, with its consequent expense, to say nothing of the loss of the engineer's time and injury to the fireboxes. Further information as to this device may be had of the Mechanical Boiler Cleaner and Manufacturing Co., Mattoon, Ill.

The later device, and one of which the patentee, Mr. J. B. Barnes, Superintendent Motive Power of the Wabash system, speaks very highly, is free from the objectionable feature of exterior pipes, as well as of pipes inside the boiler.

It consists of a semi-annular purifying or settling re-



GRAND CENTRAL STATION, NEW YORK CITY.—PROPOSED ARRANGEMENT OF ROOMS, PLATFORMS AND TRACKS.

Designed by WALTER KATTE, *Chief Engineer New York Central & Hudson River Railroad.*

ceptacle, made by riveting a $\frac{3}{16}$-in. plate to the inside of two solid rings, about $2\frac{3}{4}$ in. thick, one close to the front tube sheet, and the other about 8 ft. back, both fitted to the inside of the boiler shell. The sheet extends upward on each side to about the water line, where its edges are bent toward the shell, reducing the space to $\frac{3}{4}$ in. About 2 ft. back from the front ring is riveted an intermediate ring, having a gap of about 12 ins. at the bottom.

The checks are placed between the front and intermediate rings, and the water upon entering this part of the settling receptacle sinks to the bottom and passes through the gap above referred to. It then rises as it becomes heated, and before it reaches the edges of the plate, where it slowly finds its way into the boiler proper, it is believed to have attained the temperature necessary for the separation of the impurities in solution, which settle to the bottom and are periodically blown off through a 3-in. valve, with a suitable appliance for drawing the mud from both ends of the receptacle as well as from its centre, where the valve is located.

About 12 engines have been fitted with this device, and the results show that engines can be run over 6,000 miles without washing out, against 600 miles, the maximum distance that can be run without the appliance.

Mr. Barnes states that, upon examining the inside of boilers by means of hand-holes, he finds no fresh scale deposited, and in the case of one engine, with a good deal of scale on the surfaces of the firebox, the effect of the purifier was not only to loosen but to dissolve the scale.

In another case, he applied a new firebox and flues to a 19-in. × 24-in. engine, and fitted up a purifier, which cost about $65. Upon completion of the engine the boiler was filled and fired up, and given a train before the water was changed. After running 15 miles the blow-off was opened for the purpose of skimming off the grease inside the boiler, and after this the engine ran continuously for four weeks without being blown off; and when examined the inside of the boiler was perfectly clean. Improvement in the steaming of engines is said to follow the application of this device. C. B.

The Grand Central Station.

We present herewith the ground plan of the Grand Central Station, New York City, as it is intended to be rearranged at an expense of about $300,000. The object of this change was briefly stated in our columns last week. It is intended, after the alterations are completed, to run most of the local trains, which carry very little baggage, into the main train shed on their inward trips, so that they will be in position for the next outward trip without any switching. This will obviate many of the annoying delays in the yard which are now frequent. The "annex" on the east side will then be devoted almost wholly to incoming through trains. The present arrangement of the rooms is briefly as follows:

The New York, New Haven & Hartford waiting room occupies the space marked *B* and about one-fourth of the large waiting room *A*, this road being the only one having an entrance at the south end of the building. The right-hand end of this large room is now occupied by a baggage room and the northern portion of it is included in the train shed. Room *N* takes the place of the present waiting room for the Harlem Division, and the long baggage room, *P*, will occupy the space now allotted to the Hudson River waiting room. The new general waiting room has about 50 per cent. more floor space than the three old waiting rooms combined. The number of passengers using the Grand Central Station daily is from 20,000 to 30,000.

The letters in the drawing indicate as follows:

A, general waiting room. The line of pillars immediately below the figures "73 × 198" indicates the position of the wall of the present waiting room.
B, ladies' reception room.
C, ladies' toilet room.
D, ticket office, New York Central & Hudson River.
E, ticket office, New York, New Haven & Hartford.
F, stairway to men's water-closet in basement.
G, *G*¹, sleeping car ticket offices.
H, bureau of information.
J, K, stairway and passage to elevated railroad station.
*J*¹, stairway from train shed to elevated station.
L, *L*¹, news stands under stairway.
M, stairway leading up to general offices. The superintendent's office of the New York, New Haven & Hartford is reached by the small stairway leading from *J*.
N, lobby.
O, corridor.
P, telegraph office.
Q, parcel room.
R, general agent's office.
S, office of general manager of Grand Central Station.
T, baggage room.
U, water-closet for employés.
V V V, stationmaster's office.
W, baggagemaster's office.
X, baggage room.
Y, stairway leading up to general offices.
Z, platform.

The ticket offices are 41 ft. 6 in. long. Stairway *J* is 11 ft. wide and *J*¹ is 8 ft. wide. The tracks, as shown in the diagram, are about 40 ft. shorter than as now laid, the present buffing posts being near the line *G*, *H*, *G*¹. One of the present tracks is to be taken up, the existing platforms not being of uniform width.

Length of Rigid Wheel Bases—New England Railroad Club.

At the regular meeting of the club May 14, the subject was "the length of rigid wheel base that is permissible on American railroads." It was introduced by Mr. F. M. Twombly, Old Colony, who said in part:

These notes will be confined to a few facts and figures

that have come under my notice, hoping that they will be the means of provoking some discussion. It is presumed that the minimum as well as the maximum length is in order to be considered. It is a fact that a 3-ft. wheel base has and will run successfully on a track of 4 ft. 8½ in. gauge. It is my opinion, however, in order to get good results as regards flange wear, that wheel bases should not be less than gauge of track. The reason for this is that with more length the tendency of the truck to get crosswise of the track is more easily checked. It has been said that locomotive builders in the early days of outside cylinders thought they must have a short truck, and for that reason placed the cylinders very high. That idea seems to be exploded, as trucks run well that have spread enough for cylinders of more length than was in use in those days. Following this idea, the longer wheel base the better, but of course there is a limit to this, where, I will not attempt to fix.

The most trying truck that can be placed upon a curve is a six-wheeled truck with the middle pair equi-distant from the other two. Your attention is called to two curves on the road with which I am connected, around which such trucks, having an 11-ft. wheel base, have to run, as do locomotives of the American type. The first is a curve with radius of 286.5 ft.; the second has a radius of 212.22 ft. These curves any of our locomotives or cars are expected to go over. To particularly analyze the relations that exist between a wheel base and a curve, I have taken the curve of the shorter radius, viz. 212.22 ft., a six-wheeled car truck with 11 ft. base and a locomotive of the American type, with total wheel base of 23 ft. 5 in., with four-wheeled truck having spread of 5 ft. 6 in. and swinging centre, drivers 9 ft. apart.

The middle wheels of the car truck, with no lateral motion, on this curve would necessarily have to overhang on inside of curve an amount represented by the versed sine of a cord of 11 ft., which is found to be .86 in. In considering the locomotive it is assumed that, by reason of the swing centre on truck, the engine at that point has gone over 2 in., which I think would be the extreme limit. We then find that the amount of overhang for the forward drivers would be represented by the versed sine of an 18-ft. cord, which is 2.29 in. Theoretically these trucks and locomotives cannot go around such a cvrve, but practically they do. It is obvious that they do successfully only by difference between gauge of wheels and truck, lateral motion, together with straining of parts.

Over such curves as have been described trains do not run at speed. This curve has been selected to show what is done with wheel bases in common use. Figures are so at variance with actual practice that I am unable to determine just how much more punishment the affected parts will stand without leaving the track.

The curves in main track where trains run at speed are from ½ deg. to 5, 6, 7, 8 and 9 deg; radius of ½ deg. curve is 11,460 ft.; of a 9 deg. curve 636.6 ft.

The versed sine of an 11-ft. cord on a 9 deg. curve is .29 in.; of an 18 ft. cord it is .72 in. A 6-wheel flat or tender of ordinary length would probably take this curve without difficulty. No consideration of locomotive has been made other than of the American type, but, no doubt, there are others that will do better than the American, if the only matter to be considered was their behavior on sharp curves. On some roads the maximum curves are as sharp as 15 deg. in main track. The versed sine of an 11-ft. cord on this curve would be .84 in.; of an 18-ft. cord, 1.32 in. All kinds of rolling stock run successfully on these curves.

President RICHARDS: It seems to me that in connection with this subject the question of weights on a given wheel base is of far greater importance, as, of course, the greater the weight the more strain there is on the wheels, as the wheels slip, as they are required to, on curves. Probably in the near future the American railroads will be called upon to move greater loads than they ever have before. Perhaps as high as 300,000 lbs. in one piece; that time is near at hand—the war which has being going on, a peaceful sort of war, between the great guns and the ironclad ships, now stands in favor of the great cannons. Probably the railroads will be required soon to carry some of these great cannons from the manufacturing point to some points on the coast, possibly across the continent.

Four guns which were made four or five years ago for Italy were transported by rail from Essen to Antwerp, thence by water, I think. These cannon weighed 266,000 lbs. The largest diameter was 6.26 ft. The extreme length, that is when they were stripped down and nothing remained except the cannon as it stood on the platform, was 48.22 ft. The height above the rail when laid on the car was 13.23 ft.—120 to 130 tons raised up in the air 13 ft. high. In order to transport these guns a special car was built. These cars took the form of American two-truck cars. On top of the car was a sort of a saddle on which the gun rested, and the saddle was supported in such a way that the platform or body of the car was like the truck swivel under an ordinary car. The trucks were like the ordinary American trucks, except that they had four pairs of wheels, and the wheel base of those trucks, or what we would call the rigid wheel base, was 11.34 ft., that is .34 ft. longer than the Pullman car or the six-wheel American passenger car. The weight on each truck was 66,500 lbs., and the weight on each journal was 8,312 lbs. That is not an excessive load, but if that had been put on any but special cars no railroad could have carried it. The track would not hold it up; the sleepers would give way. The difficulty therefore is not large as to wheel base, but 8,000 lbs. on a wheel on a sharp curve is an affair of considerable importance, so far as concerns the destruction of the track. This car, of course, had to go around such curves as are provided for ordinary traffic; around a switch curve, around the yards, down into Antwerp and down into the docks; so that it would meet as bad conditions as any heavy load needs to meet.

Mr. MARDEN: I think there are cars running with 11-ft. wheel base and no allowance made whatever for the lateral motion of the middle wheels, except what naturally there is between the standard trucks and the journals. Knowing that to be the fact, I built a special car about two months ago with six wheels, 10-ft. wheel base, and made no allowance whatever for any lateral play in the middle wheels except what was natural between the journal bearings and the journals. The car was a 28-ft. car, and carried across the continent a cable weighing 43 tons, which was placed in the middle of the car, or in the centre of the car. We didn't hear of any trouble.

Prof. ALLEN: I would like to get some information, if possible, as to what the practice is in New England in widening the gauge on curves. I know that there is a difference of opinion among railroad men as to whether the gauge should be widened on curves. I would be very glad if, while this subject is before the meeting, I could get some information from various parties as to what the practice is among the different roads here in relation to it.

Mr. COUGHLIN: When I was first connected with a narrow gauge railroad it was stated that it would not be safe to run wheels or trucks on a 3-ft. gauge with more than 3-ft. 9-in. wheel base, and the result was that we had continual worriment from frogs. On frogs an 11-ft. wheel base is certainly far safer than a 3-ft. base; but of course there is a limit to all things. It is quite practical, and, I think, much safer, to run an 8-ft. wheel base on standard gauges than a 6-ft. wheel base, and that you will have less flange wear also. We have now on our road curves of 90 ft. radius; locomotives pass over them without any trouble in passenger trains. That is what we formerly supposed they could not possibly do, but they do. But on our road, of course, the gauge is narrow. When we had the 3-ft. 9-in. wheel base (we are now running the 7-ft. wheel base) we had much difficulty. We found the wheels went off the track on the outside rail for the reason that the trucks swung diagonally.

Mr. MARDEN: I have noticed particularly on our passenger equipment that with a wheel base of 7 ft. we get less sharp flanges than we do on our 6-ft. wheel base. We have cars running with 13-ft. wheel base, and sharp flanges are almost unknown. I used to be of opinion that it was necessary to have considerable play in a pair of wheels, but from actual observation I am satisfied that with any curve that we have in this section of the country, with an 11-ft. wheel base with a Master Car Builders' standard axle, there is sufficient play.

American Practice in Block Signaling.

III.

AUTOMATIC CLOCKWORK TRACK-CIRCUIT SIGNALS.

The most common form of automatic block signal in this country is the Union Switch & Signal Co.'s "Union system," which was described in the *Railroad Gazette* of June 24, 1887. This system is in use on the Boston & Albany, Old Colony, New York, Providence & Boston and a number of other roads. The same apparatus is used on these and many other roads as a station signal; but these applications should not be confounded with the block system, as in nearly every case there is only one signal at a station, and the regulations under which it is used make it a cautionary signal.

The arrangement of the apparatus in this system is, briefly, as follows: The battery is placed underground (or in any position where it is protected from freezing) at the outgoing end of a section, and from this the electric current is conducted, through one of the rails of the track, to the signal at the incoming end of the section; thence, after passing through the signal relay, it returns to the battery through the opposite rail. At switches the current is led through a circuit breaker which is opened whenever a switch rail is moved so as to break the main track. The circuit is also led through the rails of side tracks for a short distance, so that a train entering a side track is protected, the same as when on the main track, until all its cars are fully clear of the main line. The signal itself is a disc fixed to a vertical spindle, with which it is made to turn one-quarter of a revolution every time the circuit is opened or closed. The turning is effected by clockwork, actuated by a weight, which has to be periodically wound up. A lamp fixed to the upper end of the spindle gives the same indications as the disk. The electric current flowing through the rails does not operate the disc directly, but by means of a relay opens and closes a more powerful local circuit which starts the clockwork. The operation of the signal is simple, the presence of a pair of wheels on the track in any portion of the block section serving to devitalize the electro-magnet which holds the signal at "all clear." This condition continues as long as the train or any portion of it is in the section.

The signal post is placed about 100 or 150 ft. within the block section, so that an engineman on approaching it and finding it "all clear" may see it change to danger (for the protection of his own train). If it fails to move from white to red, he knows that some part of the apparatus is out of order, and he must then assume that there is danger ahead.

By a proper combination of relays and by the use of a section of line wire (on poles) the signal for each block section may be so arranged that it will not be restored to "all clear" until the train has passed several hundred feet beyond the outgoing end of the section, thus providing, in effect, a distant signal.

The arrangement by which this is generally effected, and which is described in the article referred to above, is, however, open to the objection that the signal may fail to continue in the danger position during the whole of the train's journey through the block section. Each signal is controlled by two track circuits, one of which flows through the first 1,000 ft. of the track and the other through the remaining 3,280 ft., or whatever length it may be. The withdrawal of the first circuit from the signal is observed by the engineer as he passes the signal and sees the disc move, but he cannot similarly observe the effect of his entrance upon the limits of the second circuit, as he is then 1,000 ft. beyond the signal. The arrangement of distant signals in the electro-pneumatic system seems preferable to this.

The roads using these signals give, in general, very favorable reports of their behavior. Reports made to railroad commissioners and other official bodies have given detailed records of the number of stops occasioned by the signals, subdividing the lists into those caused by a preceding train in the section, switch misplaced, broken rail, failure of battery or instruments, carelessness of custodians or inspectors and other contingencies, but the records available show such widely divergent results that they cannot be regarded as a proper basis upon which to form an opinion. Many of the failures and delays were the direct result of inexperience or lack of proper supervision. The practical point, however, with regard to failures of automatic signals from the causes just mentioned is, how numerous and how serious will be the delays to trains? And the remedy for these faults lies in constant and careful inspection and great care in securing the very best material and workmanship. The difficulties in this direction have not been entirely overcome, as is evident from the changes in the methods and means of taking care of signals; but that the results are in general satisfactory is evidenced by the erection of new signals by those roads which have tried them the most carefully. The Boston & Albany is now completing the equipment of a whole division of 54 miles, and other New England roads use them largely and with satisfaction. The Union Switch & Signal Co., however, regards its electro-pneumatic system (with semaphores) as so greatly superior to the clockwork system that it takes no special pains to spread the use of the latter. The liability of a signal to indicate safety when danger exists, which is a vital question with all automatic signals, will be discussed hereafter in connection with the pneumatic system.

A point in favor of the clockwork signals, which is regarded as important by some experts, lies in the fact that the day signal is a disc and not a semaphore. All automatic systems must make some provision for releasing a train when the signal, through some accident or mishap, stops it while the track is in fact clear. The common way of doing this is to require trains to come to a full stop, and then, after one, two, three, or any prescribed number of minutes, to proceed under control through the section. To do this the engineer must pass the signal while it stands at danger. If such unnecessary stops occur frequently, engineers, becoming habituated to passing signals standing at danger, will be liable to carelessly pass danger signals in yards and at other points where discipline imperatively requires that a train shall never pass a signal showing danger. But with all such yard signals made in semaphore form, and all automatic block signals made in disc form, it is argued that the engineer need not fall into the careless habit mentioned, because the differing forms will always be a guide to him in deciding their different degrees of importance. The semaphore, which is used in the electro-pneumatic system, has been objected to on this score, but there would seem to be no insuperable reason why the disc cannot be used with the electro-pneumatic as well as with the electro-clockwork.

One of the roads using this system has given us the following memoranda concerning cost of erection and maintenance. Sixteen signals, covering 16 blocks in which were 36 switches, cost $8,076.54. This is divided as follows:

16 signals at $300	$4,800.00
36 switch connections at $40	1,440.00
Labor, signals, average $96.78 each	1,548.54
Labor, switches, at $8 each	288.00
	$8,076.54

On one section containing 83 signals, all within a territory 11 miles in length, the expenses for maintenance for one year were $7,062.67. Of this, material and supplies are charged $2,831.85, and labor and superintendence $4,230.82. This makes a total of $85.09 per signal per year. On another section 160 signals cost for one year $86.91 per signal. This last included important renewal work (10 miles of new poles and a large amount of underground wire).

On another road the expense of maintenance was estimated at $90 per signal per year, the employment of the inspectors on other work for a considerable portion of their time making a more accurate estimate impossible.

The Forth Bridge Engineers.

Sir John Fowler, Bart, K. C. M. G., and Sir Benjamin Baker, K. C. M. G., were invested with the freedom and livery of the Turners Company at the Guildhall, London, on the 27th ult., "in recognition of their distinguished eminence as engineers, earned by many great works at home and aboard, especially the design and construction of the Forth Bridge, one of the greatest triumphs of British engineering in the Victorian age."

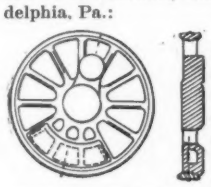
Sir John Fowler, in returning thanks for the honor conferred upon him, said that he was well aware that the reason for the distinction was his connection with the Forth bridge, which had recently been completed under the direction of himself and his friend, Sir Benjamin Baker. It would be affectation to pretend that they were not proud of this work. They were, indeed, personally proud of it; proud of having carried it to a successful completion; proud, moreover, that it was the work of British workmen; proud, too, that it was constructed of British material. There could be no doubt about its stability and durability, and he might say, if he did not trespass upon the bounds of modesty, that it was a work worthy of the engineering skill and science of Great Britain. They had, of course, great trouble and anxiety during the last seven years while the works had been in progress. But what work, physical or moral, was ever carried out without labor and anxiety. When he first saw the Pyramids he was full of admiration and astonishment at the labor and anxiety entailed upon those who carried out these wonderful works. From hieroglyphics read to him he found that the engineers were rewarded in those times in a manner very different from now. They were made governors of provinces and given many wives. As his own wife happened to be present, he would say no more on that subject; but he would conclude by saying that for all the honors which had been showered upon him and his colleague

since the opening of the Forth Bridge, there was none that they appreciated more than that which the Turners' Company had offered them.

Sir Benjamin Baker also returned thanks, and said that during the many years that he and Sir John Fowler had been associated, they had come to the conclusion that whenever they agreed their opinions must be right. The work of the Forth Bridge might, at first sight, seem to have very little connection with the turners' art, but they would see how closely it was connected in reality in considering that it would have been impossible for them to get along without calling in that art on a large scale. He and his colleagues had had many gratifying congratulations from America and elsewhere, all of which they valued, but they valued this especially as the first they had received in their own country.

Counterbalanced Forged Wheels.

The following are the claims in a patent granted to Mr. S. M. Vanclain, Baldwin Locomotive Works, Philadelphia, Pa.:



Claim—(1) A solid forged wrought iron driving wheel or centre, having a hollow counterbalance, substantially as specified. (2) The combination of the hub, spoke and rim sections of a wrought iron driving-wheel or centre with dished-out counterbalanced sections *D* and *E*, applied to opposite sides of the wheel or centre between the hub and rim, substantially as specified. (3) The combination of the hub, spoke and rim sections of the driving-wheel or centre with dished-out counterbalance sections *D* and *E*, said sections having openings *d* and *e*, to allow the sections to pass over one or more of the spokes of the wheel, substantially as specified.

THE SCRAP HEAP.

Notes.

A drunken section master shot and killed a man and a woman in a passenger train near Clay City, Ky., May 4.

General Passenger agent E. A. Ford, of the Pennsylvania Lines west of Pittsburgh, has discharged a traveling passenger agent for accepting commissions on ticket sales over connecting roads.

The Old Colony has been indicted by the Grand Jury at Boston for failing to make weekly payments to employés. It is said that the road will contest the case on the ground that the law is unconstitutional.

The Philadelphia & Reading's new coal trestle and shipping pockets on the Erie Basin at Buffalo have been completed and are now in operation. The trestle is constructed with 80 pockets, ranging from 45 to 100 tons each, and the total storage capacity is 6,250 tons. The first shipment from these new pockets was made last week, when the new large steam propeller, the "Helena," loaded 2,680 tons of coal in 3 hours and 50 minutes. Several other vessels have since cleared with cargoes of coal for Western lake ports.

Clever Ticket Forgery.

The passenger department of the Kansas City, Fort Scott & Memphis has just discovered a ticket forgery which for cleverness has rarely been equaled. In 1888 the Missouri Pacific sold [to a broker] a lot of coupon tickets from St. Louis and other points reading to points over the line of the Memphis road, and limited by punch to the year 1888. A number of these tickets have lately been received at the auditing department of the Memphis line, altered to appear to read 1890, the year 1888, which had been punched, having been erased, and the figures 1890 built around the cancellation hole in india ink. This necessitated a transposition of all the other year dates. The months are similarly transposed, the tickets in question having been changed from March to April. The date on the back was made with a ribbon stamp. The work was done by hand and so cleverly as to almost defy detection.

Rights of Way in Indian Territory.

In the United States Senate on Saturday last, Senator Dawes, of Massachusetts, presented a communication from the delegations of the five Indian Nations, remonstrating against the numerous grants of right of way for railroads through the Indian Territory. Mr. Dawes said that it had come to the knowledge of the Committee on Indian Affairs that a great many applications have been made for such right of way, either for the purpose of selling them to railroad companies already built through the Territory, or for the purpose of holding them in terrorem over companies intending to build railroads there. There were now more than a dozen such bills pending and unacted upon in the committee, and he was confident that as many more had been reported, and had passed the Senate this session. The remonstrance was referred to the Committee on Indian Affairs.

The Railroad to Jerusalem.

A railroad company has been formed in Paris, under Turkish management, which proposes to construct a railroad at once from Jaffa to Jerusalem. The concession also gives the company the right of constructing branch lines to Naplons and Gaza.

Train Accidents in India.

As compared with the average of the five corresponding previous quarters, the number of accidents to trains, rolling stock, permanent way, etc., for the second quarter of 1888-89 on Indian railroads shows an increase of 99, or 9.84 per cent., with an increase of 2,384 miles, or 18.65 per cent., on the mileage open, and of 1,105 miles, or 8.50 per cent., on the train mileage. Of the casualties to passengers, seven were killed and 90 injured by an accident to a mixed train on the Northern Section of the Eastern Bengal State Railroad on April 15, 1889. This train, while crossing a bridge just after leaving Madhnagar Station, was blown over by a tornado, 10 passenger vehicles and 19 goods vehicles being thrown down into the bed of the river or down the abutment. The total number of passengers killed during the period under review was 150, and of injured 335; average of corresponding quarters of five previous years was: killed, 106; injured, 201. In addition to the above, 16 persons are reported to have been killed and 45 injured in yards, workshops, etc., and 184 persons to have died in carriages and at stations from causes unconnected with working of trains. A tabulated statement has been added to the returns comparing the accidents on Indian roads with those on English roads for the year 1888. The number of accidents per 1,000,000 train-miles on the Indian roads was 64.90 against 5.64 on the English roads, and the number of passengers killed and injured per 1,000,000 of passengers 0.03 and 0.27 against 0.01 and 0.80 respectively.—*Colonies and India.*

A South American Railroad.

The Province of Buenos Ayres, Argentine Republic, has rejected a bid of $35,000,000 made by Samuel B. Hale & Co., for the Great Western Railroad, and has extended the time for further bids till Aug. 14, 1890. The line extends from Buenos Ayres for 961 kilometres in a northwesterly direction through a populous and fertile part of the Republic. The official inventory fixes the value of its lines and lands at $27,970,027, and of its rolling stock, etc., at $7,917,263; total, $35,887,290 gold. Ten per cent. on this amount is added by way of right of working, making a total valuation of $46,643,477 gold. Tenders are to be accompanied with certificate of deposit of $1,200,000 gold in the Provincial Bank, and the lines will not be delivered till 50 per cent. of the price is paid. On the part of the government it is agreed that there shall be no competition against the lines for 15 years, and that exemption from taxation and importation dues shall be granted to them.

Accident at the Louisville Bridge.

A caisson at the new bridge at Louisville, Ky., capsized on Wednesday, killing one man and injuring several others. A caulker was inside the caisson and 14 men at work cementing the outside. The caisson began to careen, and there was an effort to right it, when suddenly the timbers holding it in place snapped, and the structure slowly turned over, and now stands bottom up. The men clambered up the sides. C. P. Mitchell, assistant superintendent of the work, was caught by a falling beam and almost instantly killed. Three men are missing and five are badly injured, but none fatally. The men who escaped were at once taken from their perilous places by boats that hurried out from the shore.

Conditions of Success.

A Chicago paper has interviewed Mr. J. C. McMullin, Vice-President of the Chicago & Alton, on the occasion of the 30th anniversary of his entrance into the service of the company, and prints some of his views, from which we make extracts below. It will be observed that the change from a new country to an old one, which is really what has altered the conditions of wages and of advancement on most of our roads, is clearly recognized, though the old and familiar phrases by which ambitious young men have been induced to enter the railroad service are reiterated in the usual form. It does not appear, however, that this is a verbatim report of Mr. McMullin's words. In the same paper we read of another Vice-President who has made progress similar to Mr. McMullin's in less than 15 years, about one-half the time taken by the latter. It would be interesting to see a comparison of the reasons for this great diversity in the rate of progress. Mr. Mullin says:

If I were starting in life to-day I should choose a different vocation from that of railroading, and for the reason that the conditions have so completely changed since I first began the work. Still, if a man shows a special fitness for it, he should follow his bent, and if there be anything in him it is bound to come to the surface. There is a constant demand in railroad circles for competent heads of departments, and the supply is never equal to the demand. Yet the field is so well occupied that it is hard for a man holding a minor position to forge to the front. If any young man thinks of entering the service I should advise him to keep out of a general office, and to begin at a country station where he can be a unit and prove his adaptability to the work. If he be faithful and shows what he can do in an emergency, the division superintendent will be quick to detect it, although the young man may not know he is being watched. A larger office may be suddenly vacant and, quite unexpectedly to him, that diligent young man will be sent to take charge of it. Here he will come under the notice of the general manager, and the first thing he knows he will be wanted at Chicago. Once in the city his advancement will be rapid if he sticks to his work and does not lose his head. It is the man who thinks he should be promoted and writes for anything and everything in sight that is seldom advanced. . . . Again, I bring a man in from the country and advance him to a responsible position, but before I do that I say to him, "Now, in a little while you will probably have a dozen offers from other roads; what assurance have I that you will stay with me?" . . .

The Tortoise.

The innocent glee, childish sportiveness and other charming characteristics of the Denver reporters who were delegated to welcome to that city the new Burlington fast train were such that we must give to a waiting world a few extracts from their two-column articles. They came east 300 miles to meet the train and worked their imaginations up to a high pitch. A real dining car being something of a novelty, their enthusiasm is excusable, especially as the wine list was doubtless marked D. H. They have christened the train the "Tortoise," a name which for originality will certainly turn every competitor green with envy. Out in Nebraska the Tortoise lost some time by running over a cow and by a hot-driving journal, but this was easily made up, and without any further mishap the train rolled into the Union depot, in Denver, five minutes ahead of time. This, said the engineer, could not be easily avoided, as "the blamed thing slid in like it was greased." In exhibiting the abilities of his engine as a "flyer," the engineer at one point struck a bridge over a small creek, "at such a rapid rate," said one passenger, "that the suction took all the water out from under the trestle, leaving it much the same as the Red Sea was when Moses led his hosts away from Pharaoh's outfit." "From the sluggish Missouri to the mountains there are but a dozen stops, the longest of which is at Oxford, where five whole minutes are sacrificed. At nearly every station the train was ahead, and occasionally it was absolutely necessary to do some genuine loafing to idle away the accumulated moments and prevent the running card of the road from getting tangled up in all sorts of complications. There was quite a crowd at the Union depot (Denver) staring through the iron fence. They probably expected to see the train come tearing in with a snort and bring up with a vicious application of the air brakes. It didn't do anything of the kind, for the excellent reason that it had been doing a snail act all the way from the Grant smelter in order to avoid getting in too soon. The Burlington is now on top. Omaha, poor, old, deserted and neglected Omaha, mired in its hills of sticky, yellow clay, hears in the early morn a shriek of mockery as the Burlington 'Tortoise' rushes past 18 miles to the south. It is no longer even a whistling post on the great trans-continental line."

Mississippi Rules for Railroad Companies.

The Mississippi State Railroad Commission has issued circular No. 63, for guidance of railroad employés running in that state. It directs that the races shall be kept separate at all railroad stations where waiting room accommodations have been provided. Station agents are made by law guardians of the public peace, with power to arrest disorderly or objectionable persons. All stations must be open at night, lighted, and in winter provided with fires. Should agent or operator fail to post a bulletin of the train movements, whether on time, or, if late, how much so, he is subject to a fine of $50. Conductors are empowered to arrest any disturbers of the peace or any persons gambling on the train. It shall be unlawful for any railroad company to abolish a passenger station when once established. The commissioners conclude the circular by requesting citizens to notify them of any violation of the above rules.

Good Advice to Railroad Men.

An exchange states that Mr. Norman Beckley, General Manager of the Cincinnati, Wabash & Michigan, has decided to advance the pay of the employés of that road in several departments of the service, and in connection therewith quotes from his circular as follows: "The man who locates and settles down to steady business acquires competency. With the advance of wages you may be able, with prudence and economy, to provide a home and lay by for a rainy day. Railroad men should occupy a position in society and become citizens of influence, and in no way can they do this as well as by establishing themselves in their own homes. The management wish to encourage men in making homes, and in order to do this will transport for them all building material at low rates. They wish also to assure men that they will be retained in the company's service provided they are loyal and industrious, and that vacancies shall be filled by promotion as fast as possible. Men who save money and build homes make the best employés, and will be given preference. Men who are never absent from duty, who lose no time, are preferable. Men who are prudent in their habits, do not drink, nor use tobacco nor profanity, will be appreciated, and will be encouraged and promoted, knowing that the company's interests are safe with such men."

A Lost Locomotive.

The British steamer Wellington, which arrived at San Francisco May 2 with coal, from Departure Bay, went to Long Bridge on arrival to take on a locomotive, which was to be shipped to the Esquimalt & Nanaimo railroad which operates a line from the Union Mine to Departure Bay, B. C. The steamer went up with her inward cargo on board so as to be low in the water and facilitate the placing of the locomotive. The locomotive had been landed from the cars onto a platform on the dock, and the steamer made fast alongside the wharf, port side to. A stout gangway was built from the dock over which the locomotive could be transferred to the ship, but while it was being lowered the tackle snapped and the locomotive broke loose. It tore across the deck, crashed through the iron bulwarks on the starboard side and fell into the bay. The locomotive weighed sixty-five tons, and sunk so far in the mud, which is there about 40 feet deep, that it could not be found when sounded for the next day.—*San Francisco Bulletin.*

A Concession Canceled by the Shah.

The Shah of Persia has canceled the concession obtained by a Russian company for the construction of a railroad from Reshd, in the province of Ghilan, to Euzellee, the seaport of the former place, 16 miles southeast of Reshd.

TECHNICAL.

Public Works in Canada.

The Canadian government's estimates for expenditure on account of railroad and canal construction during the coming fiscal year show a decrease from $6,324,894 to $5,122,100 as compared with the year just concluded. The expenditure on the Intercolonial is placed at $187,000; Cape Breton, $50,000; Oxford & New Glasgow, $30,000; Eastern Extension, $35,000, and on canals $4,852,000. Of the total $3,271,892 is to be revoted. Heavy expenditures this year on the Intercolonial for construction and providing increased accommodations account for the large increase in the vote. Under canals there is $1,641,000 asked for the Saulte Canal, or $350,000 more than this year; but $1,141,000 is a revote. The Cornwall Canal calls for $1,000,000 against $1,200,000, but $980,000 is a revote. These new expenditures are asked: Farran's Point, $100,000; Rapid Plat, $350,000; Gallops, $240,000; $1,000,000 for the St. Lawrence River and canals against $600,000 this year. On the Murray Canal it is estimated that $150,000 will be required for completion of the work. This is a revote, as is also $104,000 asked for the Welland Canal for deepening it to 14 ft. throughout and paying for land damages at Grand river. A revote of $76,000 is asked for Trent River navigation. For public works chargeable to capital, $397,000 is asked against $515,000. The vote is thus made up. Construction of Port Arthur harbor, $40,000; dredging Kaministiqua River, $25,000; Kingston graving dock, $160,000; Cape Tormentine harbor, N. B., $110,000; Quebec and Montreal Esquimalt graving dock, $120,000. For public works chargeable to income, $1,704,485 is asked.

The Brooklyn Bridge.

At a meeting of the bridge trustees, May 12, it was resolved to request the Mayors of New York and Brooklyn each to appoint an expert, who, with the chief engineer and superintendent of the bridge, shall examine plans submitted to them and report to the board such plans as in their judgment are suited to the improvement of the facilities at or before the next meeting. The president is authorized to call a special meeting to consider this report, also to employ architects to prepare plans for buildings. The experts appointed by the mayors will be paid a reasonable compensation by the trustees.

Burton's Train Signal.

Mr. George D. Burton, of the Burton Stock Car Co., has just received a patent for an electric train signal, of which the principal peculiarities are a bell in each passenger car as well as in the locomotive and the placing of conducting wires, of which there are three, in one cable, which is strung through the train in the same manner as is done with an ordinary bell rope. One of the wires has circuit closing devices in each car and a bell in the engine; another has a circuit closer in the engine and a bell in each car, by means of which the engineer can answer signals given him; the third wire constitutes the return portion of the metallic circuit for the other two. A pull on the cable moves a circuit closing lever in the end of the car. This device has been tried on the Fitchburg road.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We understand that the tests of brake shoes and brake shoe material will be postponed until July or August. Probably this would be a wise thing to do. It looks now as if it would be quite impracticable for the committee to make the tests and get up a report satisfactory to themselves in time for the Master Car-Builders' convention.

Changes in time-tables ought to be announced in advance. The average railroad man does not understand how much the public suffers under the present practice. He is reluctant to make a new time-table public until it actually goes into effect, because he fears that it will produce confusion. As far as this point goes it is good, but there are considerations on the other side which he overlooks. A passenger wishes to make plans for a journey. He has reason to believe that there may be a change in the time-table, and tries to find out what it is to be. On the initial road he can probably get information from the proper authorities if he takes enough trouble. But with regard to the times of connecting lines they cannot tell him, because they do not themselves know. He is obliged to work in the dark, and often to lose valuable time. What do the railroads gain by this policy? Almost nothing. They avoid putting up new time-tables too early. They by no means avoid putting them up too late. The failure to announce changes soon enough does much more harm than it would to announce them too soon. In this respect American managers might learn a lesson from their brethren on the other side of the water. We have before us, as we write, a time-table of the St. Gothard Railroad for the summer season, going into effect June 1. If Europeans can use such a time table without producing confusion Americans can surely do the same thing. We are glad to note the announcement of a few trains, such as the New York-White Mountain Express, in ample season, but what is needed is the adoption of such a practice more generally. The English roads, or at least many of them, have a regular date for changing (the first of the month). Why cannot we? This is one of those cases where a little care in making an announcement in the right way would be worth more than a great deal of indiscriminate advertising.

The local trains of the New York, Lake Erie & Western, which run to and from Jersey City over the Newark loop, which rejoins the main line at Paterson, 16 miles north of Jersey City, now extend their trips to Waldwick, eight miles north of Paterson. To facilitate the extended run a new interlocking system has been put in at Paterson, at the junction of the branch and the main line, and at Waldwick a large yard has been established. A feature worthy of special note is the absence of a turn-table at this terminus, the trains being reversed on a Y. Where land can be cheaply purchased or is already available, a clear saving can be effected, both in first cost and in subsequent expenses of operation, over the usual plan of turning the engine on a table and switching the cars. If the spur leading off at a right angle to the main line is long enough, all passenger trains can be turned upon a Y with a facility not to be compared with the slow switching process; and the saving in wear and tear of brake hose, air-signal hose, heating hose and buffers and couplers is not by any means beneath notice. Combination baggage and smoking-cars can also be kept always with the baggage end next the engine, and the old-fashioned but sensible plan of running passenger cars so that the toilet room will always be at the rear can be followed. The labor of turning a heavy locomotive on a table is a considerable item. Many tables are somewhat poorly cared for, and two or three extra men are often required, whereas a train turning on a Y can be handled by the minimum crew. By running all trains in at the same switch, the switch furthest from the main track can be made automatic (if the tracks are used for no other purpose), and one man can do all the switch-turning without hurrying. This economy, though not unimportant is one that cannot be accomplished on an old established road in a day, but must be introduced at one place at a time, as opportunity offers. At any country station which is likely to ever become a terminus for trains, land should be purchased in advance of needs, if a good chance offers, so as to forestall real-estate speculators. If a narrow strip at right angles to the main line is not available a wide lot should be bought, as the use of it for other purposes or its sale in future years is generally more than likely to repay its cost. Even in cities existing tracks can, in many cases, be adapted for use as a turning Y, by making slight changes in methods of operation, without acquiring additional land. A new road should be able to get along without any turn-tables at all except at engine houses.

Single and Double Exhaust Nozzles.

Within the last two years opinions of railroad men have been largely in favor of the use of single exhaust nozzles, on the theory that less back pressure is caused in the cylinders than with the double ones. Probably this is true if the single nozzles are properly designed and arranged, but it by no means follows that the use of a large single nozzle will always give less back pressure in the cylinders than smaller double nozzles. To illustrate this point we give two indicator cards taken from the same engine, one when equipped with single nozzles, fig. 1, the other when equipped with double nozzles, fig. 2.

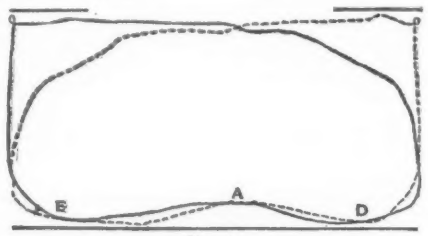


Fig. 1.

The number of different designs of exhaust pipes, nozzles, smoke arch arrangements, and smoke stacks is altogether too large, and their characteristics are too much varied to show real advance. If the designs of such devices were becoming more alike and were differentiating into a few well-developed types, we might feel that we were reaching that much desired end, a full knowledge of the relative merits of different designs; but as it is, no one type or arrangement of these details has been sufficiently well developed to enable any one to say conclusively just what its relative merits are. As a result there is an interminable variety of designs and dimensions covering a much too wide range for it to be possible that they are anywhere near an equal value, and yet there is hardly one of these designs but has its advocates and enthusiastic supporters who declare it to be the best of all, and do not hesitate to recommend their friends to try it on entirely different engines, working under other conditions from those where the device has been considered to be satisfactory.

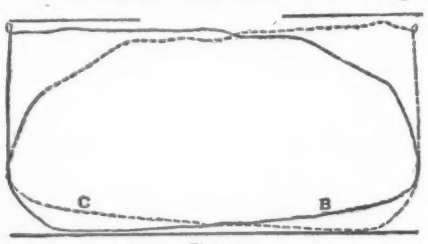


Fig. 2.

Probably the greatest difference of opinion exists between those persons who advocate the single and double nozzles, respectively. The advocates of the single nozzle declare that the back pressure in the cylinders is much less and the draft is better. On the other hand, the advocates of the double nozzle, while expecting a little greater increase in back pressure, hold that the draft is superior to any possible design of single nozzle. Here is an illustration of the fallacy of general statements with respect to the merits of these devices, which shows conclusively that more depends upon the small features of the designs upon the types of exhaust nozzle.

Fig. 1 shows indicator cards taken from the front and back ends of a locomotive cylinder with single exhaust nozzles. It will be noticed that the contour of the exhaust pipes and the shape of the passage and openings used are such that when one cylinder exhausts it either increases the pressure in the other or prevents the exit of the exhaust from the other, as shown by the rise in the back pressure line at *A*. These exhaust nozzles were of reasonable design, and their shape was such as would have been approved by nearly all advocates of the single, high, exhaust nozzle. The nozzles were $4\frac{3}{8}$ in. in diameter, the steam Presssure was 145 lbs., the speed 9 miles per hour, the cut-off at $17\frac{3}{4}$ in. Under these conditions the mean back pressure was $9\frac{7}{10}$ lbs.

In the second case the indicator cards shown in fig. 2 were taken from the same engine at the same speed and under identical conditions except with double exhaust nozzles, $2\frac{15}{16}$ in. in diameter. It is noticeable that in this case the steam did not escape from the cylinder as rapidly at first as with the single exhaust nozzle. This can be seen by comparison of the back pressure line at *B* and *C*, fig. 2, with the same lines at *D* and *E*, fig. 1. In this case the mean back pressure was $9\frac{7}{10}$ lbs., or exactly the same as when the single nozzles were used.

If the exhaust passages in the case of the single exhaust nozzles could have been so arranged, which is somewhat doubtful, as to remove entirely the rise in back pressure, shown at *A*, fig. 1, the mean back pressure in the case of fig. 1 would have been extremely small, probably not over 3 lbs.

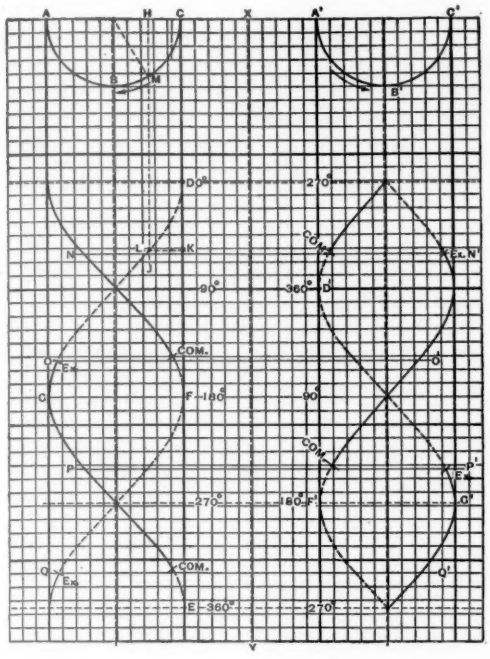
This subject is one which, while not pressing, should receive careful attention. It is best to know, in order to check somewhat the tide of opinion, which flows in favor of the single nozzle, and to withhold enthusiasts from the belief that any single nozzle is better than a double one, that conclusive experiments regarding the relative merits of single and double nozzles have not as yet been made public, if indeed any ever have been made. The examples here given may be taken as a fair sample of the relative merits of the average designs of single and double nozzles as affecting back pressure in the cylinders.

Steam exhausting from locomotive cylinders has a high velocity, and crooks and turns in its path produce a marked resistance to its movement; hence, the shapes of the conduits, pipes and passages, as well as the nozzles, ought to be carefully considered, for the reason that a design of locomotive otherwise meritorious may have defects at these points which will materially affect its economy, operation and capacity for heavy work.

In order to show the action of the exhausts from a pair of locomotive cylinders with cranks at right angles, when both are discharging through the same exhaust nozzle, or into the same receiver, as in the case of some locomotives for elevated roads, we show in fig. 3 a diagram which is laid out for the locomotive from which these indicator cards were taken.

The semi-circles *ABC* and *A′B′C′* represent the path of the crank around the centre of the axle. The line *DE* and *D′E′* is laid off at right angles to *AC* and *A′C′* and the distance between *DE* is the same as the semi-circumference of the crank circles *ABC*. From *D* to *E*, therefore, is 180 degrees of crank movement. *F* is the 90 degree point, as shown. The curve *DGE* shows the variation in the volume of the cylinder from the end of the stroke for the different angles of revolution. It is found by prolonging the lines passing through the crank positions in the semi-circle *ABC* until they intersect the line of the crank positions at right angles to the line *DE* as shown at *HJ* and *KL* the point *K*, corresponds to the same angle of revolution as the point *M*. It is evident from this construction that, omitting the angularity of the connecting rod, which in this case is

very small, *HC*, and therefore *KL* represents the distance of the piston from the end of the stroke. *X Y* is a centre line drawn at a distance from *CE*, equal to the capacity of the passages between the valve seat and the exaust nozzles added to the clearance in the



Right Hand Cylinder. Left Hand Cylinder.

Fig. 3.

cylinder. On the other side of the centre line *XY*, the curve shown is produced in exactly the same manner from the opposite cylinder, and it will be noticed that the crank positions are just 90 degrees apart; that is, when the right hand crank, which is ahead, is at the end of the stroke, as at *D* and *E*, the other crank is on the quarter, as at *G'*. Therefore, the curves shown are not co-incident in form at identical point on the line *XY*, but are displaced from each other 90 degrees. On the lines *DGE*, and *D'G'*, &c., are marked the points of the exhaust opening and closure, as shown at *Ex.* and *Com.* (exhaust and compression).

The diagram, therefore, shows the variations in capacity of the ends of both cylinders reckoning from the piston face to the exhaust nozzle tip. The dotted curves show that portion of the stroke during which the steam is expanding or being compressed; that is, when the cylinder is not in connection with the exhaust passages and nozzles. To the contrary, the full lines show the portion of the stroke during which the exhaust passages are open from the piston face to the nozzles. The lines *DGE*, and *D'G'*, represent the front ends of the cylinder. The lines *NFQ*, and *N'*, *F'Q'*, represent the back ends of the cylinder.

When the right crank is on the dead centre or at 0 degrees, which is at *C* and *D*, the front end of the cylinder is taking live steam and the back end is exhausting into the exhaust pipes, as shown by the full and dotted lines just referred to. The left-hand crank at this time is at 270 degrees, as shown. The back end of that cylinder is filled with expanding steam, as shown by the dotted line, and the front end is open to the exhaust, as indicated by the full line. As the right crank, which leads, now moves toward 90 degrees, which is at *B*, the exhaust from the back end of the left-hand cylinder soon follows at *N'* at the point marked *Ex.*, which is just after the closure of the exhaust on the front end of the left-hand cylinder, as shown at a point marked *Com.* on the full line for the left-hand cylinder. When the back side of the left-hand cylinder exhausts at *N'*, its impact is made on the right-hand cylinder at *N* on the back side of the piston. The line *NN'* is drawn at right angles to *XY*, and the points where it crosses the curves indicate the simultaneous positions of the pistons. In this way the line *OO'* shows that the front side of the right-hand piston exhausts against the back side of the left-hand piston at *O'*, and the line *PP'* shows that the front side of the left-hand piston exhausts against the front side of the right-hand piston at *P*, also the line *QQ'* indicates that the exhaust from the back side of the right-hand piston is against the front side of the left-hand piston at *Q'*.

This is a simple diagram to illustrate what may be expected if one cylinder exhausts over into the other. It also shows the relative rapidity of change in volume of the cylinders, and the rapidity with which the exhaust is being pushed out. For instance, at all the 90-degree points the curve of volume bears the greatest angle to the centre line *XY*, and indicates that the volume is changing most rapidly.

The distance between the lines *CD* and *XY*, and between *XY* and *A'D'*, corresponds to the capacity of the exhaust pipes, passages and cylinder clearance. *AC*, and *A'C'* represent the capacity of the cylinders. Thus at any time the volume between the faces of the right and left-hand pistons which are open to the atmosphere is represented by the distance between the respective curves at that time. For instance, the distance from *N* to *N'* is a measure of the volume of space, including the cylinders and exhaust passages between the back side of the right piston and the the back side of the left piston.

A study of these diagrams is instructive, and there are other interesting points which are clearly indicated by diagrams such as this, therefore we shall have occasion to refer to them again with reference to further actions of steam in locomotive cylinders.

The "Battle of the Brakes."

For many weeks the "battle of the brakes" has raged with extreme fury in the English and the colonial press. It has not been confined to technical journals, but the lay press, in England, India and Australia, has pitched in with great ardor. The conflict became serious when some so-called trials of the Westinghouse and the automatic vacuum were made in India. It languished, however, in England until the Carlisle accident on the London & Northwestern called attention to an automatic vacuum failure, but it has become bloody since a coroner's jury, sitting on that accident, decided that the collision was entirely due to the failure of the brake with which the train was fitted, acquitted the driver of all blame, and expressed the opinion that "the London & Northwestern Railway Co. are incurring great responsibility in using a brake of such uncertain and unreliable character." The railroads are denounced for continuing to use such a deadly contrivance as the automatic vacuum brake, with an exaggeration of statement and a disregard of facts which remind one of the way in which our own daily papers treat what they call "air-brake failures."

The discussion has for us in the United States but a moderate interest. There is no chance of the automatic vacuum being used here on any but a very few roads, peculiarly situated. This is so well recognized that none of those companies which are in the market, or which seriously contemplate entering the market in competition with the Westinghouse, think of offering anything but a compressed air brake. Even the Eames Company, the only company that has ever done anything here with a vacuum brake, will do nothing in equipping trains for general service until it is ready with its new pressure brake.

The outcome of "the battle of the brakes," therefore, is important here only to those who wish to sell brakes in foreign markets, and it will have to be fought out on foreign soil. So far it has been a Chinese battle, consisting mostly in shouting and making faces. The automatic vacuum has never been applied, with quick-acting devices, to long and heavy trains. In the alleged trials in India, the Westinghouse train was 1,415 ft. long, and weighed 573 tons, while the vacuum train was 790 ft. long and weighed 341 tons. For many other reasons the trials were of no value in determining the comparative efficiency of the two systems. It is quite probable the trials to be made in South Australia next September will be more valuable.

Meanwhile comparative tests in service are constantly going on in England, where 5,881 engines and 24,979 cars equipped with the automatic vacuum and 2,112 engines and 15,980 cars with the Westinghouse automatic are regularly running in passenger service. Records of the failures of these brakes are published each half year by the Board of Trade, and while careless, incomplete or designedly inaccurate reports are evidently sometimes made to the Board, the records on the whole give a pretty fair measure of the comparative efficiency of the two types of brake in that service. Of course the short and light trains of the English roads may be handled by brakes that would not be suitable here.

Last November we made an analysis of the Board of Trade report for the half year ending June 30, 1889. We found that the Westinghouse and the automatic vacuum trains had run 53.7 million miles without a single failure of the brakes to act when an accident to a train or a collision was imminent. In the report for the half year ending Dec. 31, 1889, we find the same record for 62.9 million train miles. A good deal of this immunity from accidents from brake failures must be attributed to the very perfect signaling on English roads. With 90 per cent. of the passenger lines worked on the block system, and with about 90 per cent. of the switches and crossings interlocked and protected by distant signals, facing-point locks and detector bars, the emergency uses of the brake must be infrequent. In the United States there must be more accidents even with a decidedly better brake.

The second class of failures reported by the Board of Trade is failures to stop a train when required under ordinary circumstances. Leaving out of account all failures directly due to faults of the employés, we find these to have been, per million train miles :

Westinghouse, first half of 1889	.09
Automatic vacuum, first half of 1889	.24
Westinghouse, second half of 1889	.17
Automatic vacuum, second half of 1889	.33

The third class of faults in operation is delays to trains due to defects in and improper action of the brake. Again, omitting delays due to faults of employés and also those *due to bursted hose* connections, we have delays per million train miles :

Westinghouse, first half of 1889	3.45
Automatic vacuum, first half of 1889	8.33
Westinghouse, second half of 1889	4.33
Automatic vacuum, second half of 1889	7.35

These figures, covering a year in time, 41,000 cars, and over 116 million train miles, certainly give a good measure of the comparative reliability of the two types of brakes in the service in which they have been run side by side. Exception will be taken to the omission of the cases of bursted hose. This does not affect class two—failures to make service stops. It only affects class three—the record of delays to trains. Moreover, we hold that a burst hose is no necessary feature of the Westinghouse system. It is a very common form of failure, to be sure, but it may be eliminated by (1) buying the best hose; (2) renewing the hose arbitrarily at fixed intervals, because rubber is bound to deteriorate with age; and (3) using a metallic connection. The last method is probably not yet practicable, but it may become so very soon; while a combination of the first two is not only practicable but to some extent practiced now.

Collecting Cash Fares.

The railroads of Missouri have had to appear before the State Railroad Commissioners to answer a complaint concerning the difference between passenger fares charged on trains and those in force at ticket offices, and the press reports indicate that the commissioners have ordered the discontinuance of the practice of collecting excess fares on the trains. It appears that the complaint originated where the ticket rates between local stations are fully up to the limit per mile, which is prescribed by law, three cents a mile on main lines and four on branches. Some of the roads have been charging an excess above this, though one of them in its defence states that it makes a *discount* at the offices instead of an *advance* on trains, which we may say in passing is the sensible plan, whether the difference between a ticket and a cash fare is to be subsequently refunded or not. People do so love a discount, and have such a strong hatred of an additional charge, however small it may be, that it is decidedly unwise not to take advantage of this whim. If the local passenger business of a railroad will not bear such a slight reduction, it must be in a very unpromising condition.

The reasons for regulating this feature of railroad operation, as the question comes before the commissioners, naturally relate chiefly to the rights of the passengers; and the convenience of the roads, which is really a matter of detail, may be regarded by the board, and perhaps rightly, as deserving but a small share of their attention, though one of the passenger agents at the hearing frankly stated that the railroads ought to have the privilege of making an additional charge on trains "to enable them to keep a proper check upon their servants."

Along with this news comes the confirmation of the report heretofore printed that two roads, the Cleveland, Cincinnati, Chicago & St. Louis and the Chesapeake & Ohio have just put on train collectors, spending probably $75 per month more than the ordinary train expenses per trip, for the purpose of enabling the revenue department to select the men to handle cash fares without any sort of hindrance. This, with the careful attention given the Missouri hearing, affords significant evidence that, though the collection of fares be a detail, it is an important one, and that the old question of conductors' fidelity is as fresh as ever. Discharges of a considerable number of conductors at a single stroke, without any satisfactory public explanation, either from the railroad officers or the discharged men, are frequently heard of in various sections of the country, and on large as well as small roads. Train collectors have been running on one or two roads for several years, though the Atchison, Topeka & Santa Fe, which adopted the system about two years ago, went back to the old way at the time of its extensive retrenchment last year. But whatever

the reasons or the results of this, a great many railroad officers seem to be getting very unsatisfactory results in this service.

But notwithstanding this widespread dissatisfaction with the American system of train collections, which every one knows is bad in principle, there are many roads which seem to have very little trouble of this kind, and a question naturally arises as to the reasons for this. When train agents are put on, various explanations are given concerning the reasons for increasing train expenses 20 or 30 per cent., but the real incentive in every case seems to be the unsatisfactory financial returns. That the real or supposed losses are large seems certain from the heroic remedy applied. An extra expense of $75 per month per train is not incurred by a careful superintendent without a very strong reason. The principal argument offered (by the advocates of the conductors) against the employment of special collectors on trains is, that the collector is just as likely to be dishonest as the man whom he displaces, and that, therefore, the relief will be only temporary. There is, however, a weakness in this reasoning. It is true that clerks from the general office may yield to temptation, and that promoted freight conductors or baggage masters may possess sturdier moral characters than the young men who are selected to handle money in their place, but in the nature of things the superintendent who adopts the collector system has the advantage that in the selection of collectors there is nothing to hinder his securing men best fitted for the specific business of collecting.

To select a passenger conductor under the prevailing system a superintendent must first find a man who can handle the train; second, one who is sufficiently "genteel;" third, one who can intelligently collect the tickets and fares, and fourth, one who will honestly return them. The last point is not the least, but is so placed because it is the one least likely to be secured. For the first qualification the man has probably had years of training; the second is one of which the superintendent can judge by outward appearances, and the third can very soon be tested; but the fourth—there's the rub. If, now, the first point, experience, can be omitted from the calculation, the problem is immensely simplified. Young men of good address and some clerical experience are always plenty, and practically the only question is as to their fidelity. With thousands of store clerks to select from, the superintendent would indeed be dull who could not choose a better force than if he were shut up to 50 or 100 freight conductors, of whom half would probably be somewhat lacking in gentility, and half of the remainder not quick at figures. And quite likely the jealousy of the passenger conductors is sometimes relied upon as a means of detecting any dereliction on the part of the collectors. But, after all, this cure for stealing costs a good deal of money. The collectors are generally of little or no value as brakemen or flagmen, even in an emergency, and so the safety of the train and the convenience of the passengers are not enhanced in the least. Cannot this expense be avoided? Is it impossible to secure faithful collectors who can also run the train?

The answer to this question, as given by experienced managers who have secured satisfactory service for many years, suggests a few simple points which are worth reflecting upon.

1. Even with the whole world to select from, without restriction, some superintendents would always have a considerable percentage of conductors unfit for their duties. This is the same as saying that these superintendents either do not know how to judge of human nature, or they do not put into practice such knowledge as they do possess. There are many such. Some promote their personal favorites. It is needless to say that this is unbusiness-like, and is a practice which almost always precludes the possibility of a perfect service. Some, from pressure of other duties, or other reasons, give too little thought to the matter, delegating it to subordinates. This is worse than direct favoritism, as it may multiply its evils. The appointment of men to such a position as this should engage the attention of the best judgment and the ripest experience that a road can command. If the pressure of work upon a superintendent, or a lack of funds for paying satisfactory salaries, is the thing that hinders him at this point, he should, of course, turn his attention at once to the directors, whose duty it is to give more strength to his arms. A superintendent must not only be a judge of human nature and carefully exercise that judgment, but he must give full play to the element of time. He cannot possible know his good men from those that are second best on a three months' acquaintance, or on any acquaintance, however long, which is so slight that he barely knows the men's names and faces.

2. Fidelity to a monetary trust is somewhat a matter of habit and training as well as of natural disposition. A boy who has worked in a ticket office, where cash accounts must be carefully corrected, is less likely to fall into careless habits, and finally dishonest ones, than would the same boy if brought up as a freight conductor, where precise distinctions between "yours" and "mine" are not constantly impressed upon him. This gives us a hint of the necessity of training freight conductors in other directions than coupling cars and managing unruly brakemen, if we hope to promote them.

3. Honest and sensible station agents and cashiers make no objection to the counting of their money by the auditor. They recognize that, to check dishonest agents, the honest ones must submit to discipline, and that irregularities of honest men occasionally require to be straightened out by a force outside of themselves. This point must be gently yet firmly and persistently impressed upon conductors, and their silly hatred of "spotters" turned into a more rational feeling. Inspection of conductors' work is right and useful, but if we may judge by past experience on many roads, the mere checking of cash collections often works no permanent improvement. The conduct of the men in other respects should be looked after; disregard of train rules, of proper behavior, etc., reprimanded. Accuse the men of something besides stealing and they will perhaps perceive the drift of things, and remove the necessity of criticising their cash accounts. A conductor has been known to stop petty embezzlement in consequence of a reprimand for flirting. He saw that a strict standard would be insisted upon in all his actions.

4. The lessons of centuries teach that all financial affairs should be constantly checked. Knowing as we do that the ordinary plan of cash fare collecting is extremely unbusinesslike, we should all the more carefully recognize and use such checks as are possible. The most important of these is the receipt. Every passenger paying a fare should receive a receipt and should be induced to put that receipt on record. The simplest way to do this is to pay him five or ten cents for bringing it into the ticket office. The various blanks for doing this are too well known to need explanation here, and the success attending their use, where such a system is employed and constantly looked after, is unquestionable.

Superintendents in the far West, or other regions where railroading is comparatively new and good men are more or less scarce, will at once say that this scheme will do very well for the older roads in the East but is impracticable with them, and that therefore they must either put up with such conductors as they can get or must engage young bank clerks for train collectors; but a pertinent query at this point is, why not take your bank clerks when a few years younger and teach them to run a train? The time and money spent in giving them such a schooling could hardly equal the $75 per month involved in running two conductors on every train, and even if it did there would remain the advantage of having a rational system instead of an absurd one. The railroad commissioners of Missouri or of any other state may well say that a railroad officer who cannot get honest conductors is of doubtful business ability; but if, by reason of the directors' refusal to pay $200 per month for passenger conductors, and $150 for men to run freight trains, he is unable to use his business ability, the commissioners ought not and probably will not refuse him the small privilege of paying passengers ten cents apiece for turning in their receipts (fare checks).

Annual Reports.

MICHIGAN CENTRAL.

	1889.	1888.
Miles operated	1,554	1,537
Earnings, passenger	$4,327,091	4,188,982
" freight	8,736,962	8,883,445
Total, including miscellaneous	13,786,925	13,776,522
Operating expenses and taxes	9,895,158	10,086,605
Net earnings	3,891,766	3,683,917
Interest, rentals, etc. (net)	2,881,036	2,876,191
Dividends	936,910	749,528
Surplus for year	73,820	58,198

To the stockholders, at least, the most noticeable feature in the operations of the past year has been the extra dividend of one per cent., making the total five per cent. instead of four. The figures show that it was fairly earned, and that the surplus, after paying five per cent. in 1889, was greater than that after paying four per cent. in 1888. On the other hand, it must be remembered that in 1887, when the smaller dividend was paid, the net earnings were much larger than in 1889, showing a rather arbitrary variation in practice.

The gain, as compared with last year, is from a reduction in expenses; and this in turn was at least partly due to the smaller amount of freight carried. The ton mileage fell from 1,279,000,000 in 1888 to 1,203,000,000 in 1889. The freight train mileage was correspondingly reduced from 6,762,000 to 6,334,000, with a good effect upon operating expenses; while, at the same time, the increased average rate per ton-mile (0.72 cents against 0.69) prevented freight earnings from showing more than a moderate diminution. The actual tonnage has increased; the diminished ton-mileage is due to shorter hauls.

LAKE SHORE & MICHIGAN SOUTHERN.

	1889.	1888.
Miles operated	1,400	1,341
Earnings, passenger	$5,082,480	$4,810,147
Freight	12,545,869	11,629,174
Total, including miscellaneous	19,487,196	18,029,627
Operating expenses and taxes	12,847,451	11,310,371
Net earnings	6,639,745	6,729,256
Interest, rentals, etc.	3,423,468	2,608,390
Dividends	2,473,325	2,473,325
Surplus for year	742,951	637,540

The results for 1889 are more favorable than would at first sight appear, because the apparent increase in operating expenses is, nearly half of it, due to the construction of 1,900 new freight cars which have been charged to this account. Otherwise the increase is pretty evenly distributed along the line.

The gain in passenger earnings is due solely to increase in volume of traffic; the gain in freight earnings is due partly to this cause, but still more to increase in rates. The figures are as follows:

Tonnage.	1889.	1888.
Eastbound	5,748,000	4,920,000
Westbound	4,272,000	4,149,000
Total	10,020,000	9,069,000
Ton mileage.		
Eastbound	1,074,000,000	985,000,000
Westbound	784,000,000	813,000,000
Total	1,859,000,000	1,799,000,000
Average rate per ton-mile	0.66½ cents	0.63½ cents
Average haul, miles	185	198
Average train load, tons	255	252

	1889.	1888.
Passengers carried	4,413,000	4,051,000
Passenger mileage	222,000,000	210,000,000
Rate per passenger mile	1.15 cents.	1.19 cents.

The inequality of the freight movement in the two directions is quite noticeable. It seems to be due to an increase of local freight eastbound; in which respect it contrasts quite markedly with the causes existing a few years ago, which were connected with through freight. The change in the character of the business shows itself still better when we look at the classified tonnage, and compare it with what there was a few years ago. If we contrast the results of 1889 with those of 1885, we find that coal and grain both show a decrease; but that iron ore increased from 268,000 tons in 1885 to 601,000 in 1888 and 984,000 in 1889; stone, sand and lime from 324,000 in 1885 to 616,000 in 1888 and 929,000 in 1889. Similar changes, though less marked, are seen in shipments of iron and its products. With these rapid changes in character of traffic, it is highly creditable to the Lake Shore that it can so quietly adapt its train economy to them, and not suffer loss in train loads.

April 30 Mr. L. S. Coffin appeared before the Senate Committee to discuss the Senate bills on safety appliances. We have already given the essential features of the Cullom bill and of the Allison bill, and they were discussed editorially in our last issue. In speaking of these bills we omitted to say that the one introduced in the House by Mr. Henderson was introduced in the Senate by Mr. Allison, and we spoke of it as the Henderson bill. As a matter of fact, the Henderson and Allison bills are identical and were prepared mainly by Mr. Coffin. In his remarks before the Senate Committee Mr. Coffin said many things that must have been instructive to the members of the Committee, and must have indicated to them pretty clearly the fundamental defect of the Cullom bill. He said that the work of selecting a coupler has already been done by far better men than are likely to be got to act in a government board. It has been done by railroad experts, who have been at work on the subject practically and theoretically for years and who are perfectly disinterested. Mr. Coffin gave the familiar facts of loss of life and limb, and then related at some length the history of the tests and investigations by which the coupler and the freight train brake have been developed, and tried to give the Committee a realizing sense of the vast amount of labor which mechanical officers of the railroads have put into these investigations. We trust that he convinced them that the present situation of the coupler and brake questions is not the result of chance or indifference or pig-headed opposition to improvements. The Committee questioned Mr. Coffin somewhat upon the relations of patentees to the M. C. B. coupler. We regret that he did not develop more clearly the fact that the patent on the fundamental lines of the coupler has been waived by its proprietors, so that those lines are free to be used by the railroad companies, and that he did not bring out more strongly the further fact that there are now in the market so many good designs of the M. C. B. coupler, manufactured by competing companies, and differing only in various patented details, that there can be no possible question of monopoly. As a matter of fact, the Committee might discover by a little investigation that the M. C. B. coupler is sold to-day at a price which allows an extremely small royalty on the patents, and in the present situation the makers can get little more than a manufacturer's profit. Therefore, granting that a government board could perhaps select some type of coupler superior to the M. C. B. coupler and purchase the patents and throw them open to competitive

manufacture, it is very questionable whether the situation would be improved from a commercial standpoint. We do not grant, however, that it is at all likely that a board could select such a coupler; on the other hand, we feel very sure that there is an enormous weight of probability against it.

On Wednesday of this week G. B. Roberts, President, and T. N. Ely, General Superintendent Motive Power Pennsylvania Railroad; C. W. Buchholz, Civil Engineer New York, Lake Erie & Western, and W. C. Brown, General Superintendent Burlington Lines in Iowa and Missouri, appeared before the Senate Committee. We have not yet received any report of their remarks sufficiently full and accurate to make it safe to try to indicate what they said.

Mr. W. G. Wattson, Car Accountant of the West Shore, sends to the *Equipment Guide* for May an elaborate scheme for an "Interstate Railway Equipment Company," and proposes a plan for consolidating, by means of this organization, the control of the entire freight equipment of the country, or at least of very large districts, in one central authority, so that freight cars could be distributed to different roads or districts with the same facility that sleeping cars are now distributed by the companies controlling them. The idea is a bold one and could be introduced only after a great deal of consultation and adjustment of conflicting interests, if it were not indeed found to fall of its own weight, as is likely to be the case, in the nature of things, with any affair of such magnitude. In fact, Mr. Wattson apparently recognizes this, but at the same time he has carefully drawn up a plan of organization, with details, which is by no means unworthy of attention. An important feature is a scheme for the numbering of cars in certain lettered series in such a way as to indicate the kind, dimensions and capacity of all cars by their numbers. It is proposed that the various railroad companies shall sell their cars to the equipment company and take shares of stock in payment, the allotment of stock to be on the basis of ton-mileage, any discrepancy between the equipment of a road and its share in the stock being adjusted by a cash payment. A re-apportionment of stock would be made every two years, at which time any road holding too much would have to sell the overplus. Mr. Wattson proposes that the equipment company shall collect its revenue on a per diem basis.

Senator Gorman, of Maryland, has introduced in the United States Senate a bill providing that Canadian roads operating in this country must obtain a license from the Interstate Commerce Commission. Senator Quay, of Pennsylvania, has introduced a bill amending the twenty-second section of the Interstate Commerce law so as to permit commercial travelers to carry large quantities of extra baggage at less rates than are charged ordinary passengers. Amendments to suit individual interests are being presented with considerable frequency, and each interest that feels any burden from the law seems to regard this as the proper way to protect itself. At this rate the Commissioners will soon find the hardest part of their task removed and can delegate their functions to clerks. As every one knows, the Canadian roads have voluntarily placed themselves under the Interstate Commerce law, and have obeyed orders from the Commission as faithfully as have American roads. What good would a license do, or what protection would it provide more than is already afforded by the stipulations of the charters which these roads have already procured from one or more states of the Union? If drummers may rightfully take heavy samples around the country free, why not allow retail merchants to visit "trade centres" at, say, one-fourth the usual fare? And in what way can the carrier favor the wholesaler, whose samples weigh no more than a lawyer's or a distiller's, so as to put him on an equality with the carpet manufacturer, whose samples weigh a ton, or the seller of road scrapers, who needs for his a special car?

The United States Circuit Court, in a case appealed from the District Court, has decided a question of the relations between the white and colored races which is similar to that which was brought before the Interstate Commerce Commission by petitioners who complained that accommodations afforded colored passengers on trains in Georgia were inferior to those enjoyed by whites. A negro on a steamboat from Baltimore to Millbreck, Va., insisted that he should sit at the white passengers' dinner table, but he was not allowed to do so and subsequently brought suit. The court decides that as the tables were in the same saloon and were in all respects equal for the two races, the steamboat company, in making a separation, had made no distinction, and dismisses the case with costs.

The Interstate Commerce Commission has warned the railroads that telegraphic notices of changes in tariffs must reach Washington the full time (3 days or 10 days, as the case may be) before the rates are intended to go into effect, and that the telegrams must be full and explicit. The Commission has been bothered by brief and indefinite statements, which, moreover, have in some cases not been followed by the tariffs. The roads must also post notices in stations the full time in advance, which must be dated the day they are posted, and the full tariffs must be posted by or before the day the new rates go into effect.

NEW PUBLICATIONS.

Annual Statistical Report of the American Iron and Steel Association for 1889. 8vo. pamphlet, 111 pages, $3. American Iron and Steel Association, Philadelphia, 1890.

Last year Mr. Swank introduced an innovation in his valuable series of reports by issuing a "Statistical Abstract" containing a part of the statistics usually appearing in his annual report. All will appreciate the convenience of a return to the old order, and will notice a decided increase in the value and extent of the information conveyed.

In the general review of the domestic iron trade the following interesting table, showing our approximate consumption of pig iron for the last three years, is found:

Pig iron, gross tons.	1887.	1888.	1889.
Domestic production	6,417,148	6,489,738	7,603,642
Imported	467,522	197,237	142,230
Stocks on hand Jan. 1	225,629	301,913	300,144
Total supply	7,110,249	6,988,888	8,046,016
Deduct stock on hand Dec. 31	301,913	300,144	247,679
Approximate consumption	6,808,386	6,688,744	7,798,337

This shows both our largest make and largest consumption, and is comparable with a make of 8,245,336 tons in Great Britain (which is 247,951 tons less than their make in 1882), and a home consumption in that country which increased, according to the London *Economist*, from about 3,250,000 tons, in 1887, to about 4,900,000, last year. A great deal of our increased consumption is due to the demands of the awakening industries of the South, which are shown by the fact that the production of pig iron has increased there from 636,460 gross tons, in 1885, to 1,380,984, in 1889. This section of the country will require a constantly increasing amount of iron for railroad, structural and other purposes, and promises to largely increase our rate of consumption per capita.

The approximate consumption of steel rails with the number of miles of railroad built and the consumption of rails per mile constructed, in gross tons, are given below:

Bessemer steel rails.	1887.	1888.	1889.
Production	2,101,904	1,386,278	1,510,057
Importation	137,588	63,016	6,202
Approximate consumption	2,239,492	1,449,294	1,516,259
Miles of railroad built	12,872	6,801	5,155
Consumption of rails per mile	174	213	294

Or, if we assume that 100 tons of rails are required for each mile of new track, 952,202 tons of rails were used for renewals in 1887 or 6.98 tons for each mile of road at the commencement of the year; in 1888 the excess for renewals was 769,194 tons, or 5.15 tons per mile, and in 1889 the excess was 1,000,759 tons, or 6.41 tons per mile of road, at the commencement of the year; from which it seems fair to suppose that between a million and a million and a quarter tons will be required for renewals this year.

Our production of Bessemer steel ingots and the percentage used for rails has been:

Bessemer steel ingots.	1887.	1888.	1889.
Production	2,936,033	2,511,161	2,930,204
Percentage in rails	71.6	55.2	51.5

An allowance of only 100 tons per mile for new mileage is probably too small, as a 60-lb. rail would require 94.3 tons per mile, without any allowance for sidings; but it it is doubtful if the railroad construction of last year called for much over one-fifth of our Bessemer output.

Our production of open-hearth steel has been in gross tons:

1887.	1888.	1889.
322,069	314,318	374,543

This low production of a steel so well suited to all structural purposes is in part due to the greater cheapness of Bessemer steel, and in part to the claims of our pneumatic steel makers for the very high quality of their product.

During the past year our prices have been steady; No. 1 anthracite having commenced at $18, declining to $17, and ending at $19.25; steel rails commencing at $27.50 and rising to $35; best refined bar iron at Philadelphia commencing at 2 cents, falling to 1.80, and ending at 2.05 cents per pound. The average prices for the year, as reported by Mr. Swank, have been, No. 1 anthracite, $17.75. This is within 12½ cents of the average price for 1878, a year of depression in which we made but 2,301,215 tons. The average price of steel rails has been $29.25 as compared with $20.88 in 1888 and $28.50 in 1885. The average price of best refined bar iron was $43.30 per ton, as against $40.32 in 1885.

The course of prices on the other side has been different from this; according to the London *Economist*, Scotch warrants commenced at 42s., fell to 40s. 10d. in February and attained a maximum value of 64s. 10½d.; Middlesborough warrants, under the influence of the German demand, from 34s. to 68s. 6d.; homatite warrants advanced from 45s. 6d. to 79s.; steel rails advanced from £4 to £7, and plates from £7 10s. to £10.; Staffordshire crown bar iron from £5 15s. to £8 10s., and sheets from £8 to £10 10s. In Germany pig iron advanced in prices by 27 to 39 marks per ton; in finished iron the advances varied from 70 to 98 marks, and steel rails "rose to the extent of from 30 to 70 marks a ton," as quoted from *Iron* by Mr. Swank. This rise in German prices has had a disastrous effect on their foreign trade, without, however, bringing any noticeable trouble to any domestic interest, and is very much regretted by their trade papers.

The differences in the course of prices in the three countries may in part be explained by the following table showing the production of pig iron from 1882:

Production in Gross Tons.

	United States.	United Kingdom.	Germany.
1882	4,623,323	8,493,287	3,380,805
1883	4,595,510	8,490,224	3,469,719
1884	4,097,868	7,528,966	3,600,612
1885	4,044,526	7,279,295	3,687,433
1886	5,683,329	6,870,665	3,528,658
1887	6,417,184	7,441,927	4,023,953
1888	6,489,738	7,898,634	4,229,484
1889	7,603,642	8,245,336	4,387,524

but, a statement that our make had increased 64.4 per cent., the German 29.7 per cent., and the English make had decreased 2.9 per cent. would be misleading without mentioning the stocks of pig iron in store in the various British yards, which at the end of 1882 amounted to 9.4 weeks' consumption, in 1886 to 19.4 weeks' consumption, and at the end of 1888 to 16.6 weeks. consumption. It was this immense stock of 2,778,684 tons at the end of 1887 that enabled England to not only stand the ship-building boom which increased its home consumption by 50 per cent., but also the heavily increased demands of Germany and other iron using countries, without much more than doubling prices. Without the heavy stock in store or with any material increase in the demand from this country, prices there would have advanced as in 1872.

Among the many interesting tables are the two following, showing the production of pig iron and steel in the following countries in 1878 and 1889; that of the United States and Great Britain in gross tons, and of other countries in metric tons:

Pig Iron.

Countries.	Production tons. 1878.	Production tons. 1889.	Percentage. 1887.	Percentage. 1889.
Great Britain	6,381,051	8,245,336	45.20	33.16
United States	2,301 215	7,603,642	16.30	30.57
Germany & Luxemburg.	2,147,611	4,387,504	15.12	17.64
France	1,427,072	1,722,480	10.04	6.93
Belgium	493,544	847,000	3.50	3.41
Austria and Hungary	434,250	761,696	3.08	3 06
Russia	409,633	532,649	2.90	2.14
Sweden	333,496	457,052	2.36	1.48
Spain	60,000	200,000	0 42	0.80
Italy	20,000	12,265	0.14	0.05
Other countries	120,000	100,000	0 85	0.40
Total	14,117,902	21,869,534	100.00	100.00

Steel.

Countries.	Production, tons. 1878.	Production, tons. 1889.	Percentage. 1878.	Percentage. 1889.
Great Britain	1,100,000	3,669,862	36.41	34.90
United States	721,976	3,387,732	24.23	32.20
Germany	570,328	1,826,000	18.88	17.71
France	281,800	529,021	9.33	5.03
Belgium	95,000	248,000	3.14	2.36
Austria and Hungary.	129.478	355,036	4.29	3.38
Russia	66,593	222.025	2.20	2.11
Sweden	25,918	114,537	0.86	1.09
Spain	250	24,500	0.01	0.23
Italy	3,000	73,262	0.10	0.70
Other countries	16 750	30,000	0.55	0.29
Total	3.021,093	10,513,977	100.00	100.00

These tables show an increase of 76 per cent. in the world's production of pig iron and 248 per cent. in its production of steel.

The Engineer for May 2 contains a number of designs for the great tower in London. One, 1,320 ft. high, is by Messrs. T. C. Clarke, Joseph Mayer and W. Hildebrand; one, 1,550 ft. high, by Mr. Max Am Ende, and one 1,300 ft. high, by Mr. W. Hugh Woodcock. The designs were made in competition in response to invitations by the Tower Company for a design for a tower not less than 1,200 ft. high.

The Journal of the Franklin Institute, May, 1890, contains papers on "The Metallurgical Arts at the Paris Exhibition," by Lynwood Garrison, and "Electrical Exhibits at the Paris Exhibition," by Carl Hering. These gentlemen were delegates of the Institute. Other papers are "Water Ram in Pipes," by Irving P. Church, and "On Schools, with particular reference to Trade Schools," by Joseph M. Wilson.

TRADE CATALOGUES.

Brass and Copper Specialties, Merchant & Co., 517 Arch street, Philadelphia.

This firm carries in stock copper, brass and bronze in seamless and brazed sheets, rolls, rods, wire, etc. The catalogue gives much information of a large variety of special material, such as ornamental rods and solid drawn moldings and shapes, and tubing in a great variety of designs.

Illustrated Catalogue of the Seaton Manufacturing Co., Cleveland, O.

This catalogue contains illustrations and descriptions of a number of bolt headers, rivet machines, upsetters, etc.

TECHNICAL.

Manufacturing and Business.

C. W. Thomas and J. H. Pendleton, members of the American Society of Mechanical Engineers, have established an office at Temple Court, 119 and 121 Nassau street, New York City, as expert and consulting engineers, with a specialty of legal matters.

The firm of Riehle Brothers, consisting of Henry B. Riehle and Frederick A. Riehle, was dissolved April 25 by the death of the senior partner, Mr. Henry B. Riehle. Mr. Frederick A. Riehle will continue the business under the firm name of Riehle Bros. as heretofore.

The Wehn Pavement Co., 16 Exchange Place, New York City, which controls the "Lithogen" system of artificial stone for platforms and sidewalks, has a large contract for the waiting room, drive-ways, sidewalks,

and four platforms, each nearly 600 ft. long, in the new station of the Wisconsin Central in Chicago. The company has also considerable work for the Pittsburgh, Fort Wayne & Chicago, and the Pennsylvania roads. This pavement is now largely used by railroads for station platforms, and floors for car shops, roundhouses, etc.

The Mason Regulator Co., of Boston, has received an order for 12 Mason air-brake regulators from the Chicago, Rock Island & Pacific, in addition to the previous order placed by the road after it had completed tests of the regulator. The company publishes a letter from Mr. J. B. Henney, late Superintendent of Motive Power of the New York & New England, in which he states that in his experience with the regulators he has always found them reliable.

The Denver & Rio Grande is to equip all the 52 standard gauge passenger cars, recently ordered, with the Scarritt car seat made by the Scarritt Furniture Co., of St. Louis.

The sales of the Westinghouse Machine Co. for April amounted to 87 engines, with an aggregate horse power of 3,195. Ten of these engines were sent to Russia. The total sales for the first four months of this year have been 296 engines, with 13,175 h. p.

Dilworth, Porter & Co., of Pittsburgh, are erecting an addition to their mill. The firm has put in a new 9-in. guide mill to increase the rolling capacity about 30 tons per day. New spike machines have been added to make the Goldie perfect spike, which will bring the output of that brand to 275 200-lb. kegs per day.

Jones & Laughlins, Ltd., of Pittsburgh, are putting in a 60,000-lb. steam hoist, built by the Crane Elevator Co., in the steel converting department, to take the place of an old one.

Howe, Brown & Co., of Pittsburgh, will put in an additional five-ton steam hammer, made by Bement, Miles & Co. in their hammer department.

The Pennsylva nia has ordered 100 of the No. 3 Wells lights of Keegan & Halpin, of New York City.

The National Car Heating Co. has been organized in Topeka, Kan. It owns the patents of J. Q. C. Searle for a double circulation hot water steam-heating system. Two cars were fitted up with this system last winter on the Kansas City, Fort Scott & Memphis road. N. R. Baker is President, J. N. Baker, Secretary, and H. W. Sharp, Treasurer.

The Aluminum Brass & Copper Co. has just completed an extensive rolling mill for the production of high-grade metal in sheets, rods and wire. The company manufactures the Cowles aluminum and silicon copper alloys in various forms. It also makes a large line of the goods generally made by brass and copper manufacturers. The works include a foundry for making castings of various aluminum and silicon alloys, also staple brass and bronze castings.

Iron and Steel.

The Bessemer Rolling Mill Co. has made a contract with the Henderson Steel Co., of Birmingham, Ala., for 30 tons of steel per day for twelve months. The steel made by the Henderson Steel Co. is by a basic process.

The contract has been let, it is reported, for the construction of a steel plant at Salem, Va.

A mortgage has been placed on record in Chippewa Falls, Wis., by the Wisconsin Iron Co., for $1,500,000, and covering 5,336 acres of mineral land in Ashland county, 206 acres in Chippewa, 4,991 in St. Croix, 9,384 in Pierce, and 13,320 in Taylor; also, land in Pierce and Dunn counties.

The Watts Steel & Iron Co., of Middlesborough, Ky., has awarded contract for its steel plant to J. P. Witherow & Co., of Pittsburgh, Pa.

The Lloyd Booth Co., of Youngstown, O., has finished an addition to its foundry. It is 60 ft. long and 50 ft. wide, and is fitted up with a 30-ton crane built by the Phœnix Iron Works Co., of Cleveland, O. The Lloyd Booth Co. has a large order for rolling mill machinery for the Birmingham Rolling Mill Co., of Birmingham, Ala., and other contracts.

The new open-hearth plant being erected at the Homestead Steel Works of Carnegie, Phipps & Co., Ltd., at Homestead, Pa., is nearing completion. There will be eight basic furnaces in the plant, and one will probably be ready to commence operations June 1.

James P. Witherow, of Pittsburgh, has closed a contract with the Bristol Iron & Steel Co., of Bristol, Tenn., for the erection of a blast furnace plant. The blowing power will be furnished by three automatic engines, with 42-in. steam cylinders, 84-in. blowing cylinders, and 60-in. stroke. Eighteen of these engines are now under construction for blast-furnace plants at the shops of James P. Witherow, at New Castle, Pa.

The Swindell & Smythe Co., Lewis Block, Pittsburgh, Pa., have closed contracts with the Pennsylvania Tube Works, Pittsburgh, for remodelling the firm's furnace plant. There will be 13 furnaces in all, and 16 circular gas producers. The Swindell & Smythe Co. has contracts with the Oil City Tube Co., Oil City, Pa., and Tyler Tube and Pipe Co., Washington, Pa., for tube welding furnace plants; additions to the furnace plant of the Paige Tube Co., Warren, O., and open-hearth furnaces and 12 gas producers for the Phœnix Iron Co., of Phœnixville, Pa.

The Belleville Steel Co., which was recently incorporated by officers of the Valley Steel Works, of St. Louis, has succeeded that company and has purchased the Waugh Steel Works, of Belleville, Ill. The company's capital stock is $450,000. The management will be the same as that of the Valley Steel Co., except that W. W. Waugh, President of the Waugh Steel Works, has been chosen Vice-President of the new company. The consolidation gives two steel plants, with a daily output of 450 tons, and using both the Bessemer and the Clapp-Griffith process. The Valley mill will continue to make nails, and the Waugh mill will make steel rails, weighing 16 to 40 lbs., billets, slabs, channels, and merchant steel.

The Rail Market.

Steel Rails.—The Duluth & Winnipeg is reported to have placed an order for 15,000 tons in the East at a price understood to be $30.50. Eastern mills quote $31; Chicago mills $35, and Pittsburgh mills $31@$31.50 on cars at mill, and $32.50@$33.50 for small orders.

Old Rails.—Old iron rails have nominal quotations of $23.50@$24 in the East. At Pittsburgh they have sold at $23.50@$24.50; and old steel rails are quoted at $21@$22. At Chicago old iron rails are quoted nominally at $22.50 and old steel rails at $19@$20.

The New Tower Bridge, London.

It was stated at Guildhall in reply to a London councilman that the time fixed for the completion of this bridge was July 11, 1891, and Sir W. Arrol, the contractor, expressed his confidence in his ability to open it at that time, but in view of unforseen causes of delay in matters of such magnitude, it might be the beginning of 1892 before the bridge is completed. It is expected that the approaches will be finished this year, excepting the paving, and the hydraulic machinery is nearly completed.

Smoke Prevention.

The following from *Engineering* may be of interest to Chicago engineers who have the smoke problem on their hand for practical solution before the advent of the World's Fair: "The case of the manufacturer who has tried to obtain the best appliance for preventing the emission of smoke from his chimney, and yet cannot satisfy the municipal authorities, is certainly a hard one. He can find plenty of inventors and others to assure him that the adoption of their appliances will secure the desired result, but after one or two failures he becomes unbelieving, and resigns himself to paying the fines which are levied upon him from time to time. To all such it will be good news to learn that a strong committee has been formed in Manchester for testing smoke-preventing appliances. It will be the object of the committee to collect the results of past experience, and to make practical tests of apparatus. With regard to the latter, experts will be appointed to make trials of apparatus or methods of consuming coal smokelessly, already at work, and under ordinary conditions; that is, with ordinary workmen, ordinary coal, and under varying demands for work. They will also make trials of new apparatus of promising character. The funds for this valuable object are being raised by subscription, and also by a guarantee fund. It is considered that as boiler owners will reap a great benefit, they should contribute to a voluntary rate of 10s. a boiler, which seems a very moderate amount. It is proposed to spend £3,000 in the first instance, and there ought to be no difficulty whatever in raising this sum. Subscriptions may be sent to the secretary, Mr. Frederick Scott, 44 John Daltonstreet, Manchester. Several hundred pounds are already promised.

Inspection of Chilled Wheels.

Messrs. A. Whitney & Sons have sent us the record of the inspection of 10,000 wheels made by them for the Savannah, Florida & Western and inspected by the R. W. Hunt & Co. Inspection Bureau. We are glad to give the makers and the contracting chill a free advertisement by publishing the record at considerable length.

These wheels were cast in from 50 to 60 Whitney contracting chills, from March, 1889, to March, 1890, at the rate of 1,000 per month, and subject to all the usual variations of iron common to all foundries in the course of a year's operations. Many of them have already given more than 60,000 miles under passenger cars and are still in service.

Size.—Each wheel was measured around the tread by a brass tape, divided into spaces of ⅛ of an inch each and numbered arbitrarily from 119 to 123. The record shows that

230	measured	119
4,365	"	120
4,325	"	121
881	"	122
179	"	123

Out of the 10,000, the extreme variation in 8,690 was only ⅛ of an inch in circumference, or $\frac{1}{24}$ of an inch in diameter, and in 881 more it was only ¼ of an inch in circumference, or $\frac{1}{12}$ of an inch in diameter.

Roundness.—Tested by a true ring resting on the cone of the wheel, not one was found with a variation of more than $\frac{1}{32}$ of an inch from the ring at any point.

Strength.—The specifications required that one wheel out of every 100 ready for shipment should be broken by a drop of 140 lbs. falling 12 feet, and that it should stand five blows without breaking in two or more pieces. For the 10,000 wheels shipped 105 were thus broken with the following results:

To start the first crack the average number of blows was $13\frac{58}{105}$.

To start the first crack the weakest required 5 blows and the strongest 58.

To break the wheel in two the average number of blows was $49\frac{58}{105}$.

To break the wheel in two the weakest required 9 blows and the strongest 118.

(Two wheels broke at 9 blows, 15 between 10 and 20, 4 between 20 and 30, 34 between 30 and 50, and 50 between 50 and 118 each.)

Chill.—The average depth of chill at the root of the flange in the 105 wheels broken, was $\frac{7}{16}$ of an inch, and the depth did not vary in any case more than ⅛ of an inch around the wheel.

General Characteristics.—Not a single wheel was rejected from the whole number offered for inspection because of any chill-cracks, blow-holes, or other imperfections of workmanship or material, and the metal in all the wheels broken up was found to be of a good, soft, open, gray in the plate and free from slag or dirt. The tread of every wheel was practically as smooth as if cast in an ordinary solid chill, and not a single one needed to be ground or in any other way made smooth or true.

Compound Lumber.

This is a substitute for solid hard wood and veneering, made by the Compound Lumber Co. at Burnham, Ill. It is described at some length by Mr. G. A. M. Liljencrantz in the March issue of the *Journal of the Association of Engineering Societies.*

The "compound lumber" consists of a core of some soft wood, ordinarily pine, with a facing of some kind or other of hard wood, in varieties to suit different tastes and requirements, which facings are tenoned and grooved together with the core in a substantial manner.

A large number of different designs are made, for example, door stiles, made of a pine core with all four sides covered with hardwood; strips to be used for floors and ceilings and strips with the hard wood made into various different molds or patterns for wainscoting. The core is sometimes covered on all four sides, sometimes on two or three, and sometimes again on one side. Besides being tenoned and grooved the adjoining surfaces of the different parts are also glued together between rollers under heavy pressure. Large cores, as those for door stiles, are made in separate strips, which are glued and fastened together in the same manner, as additional security against warping. Great care is taken to have all the lumber highly seasoned. Besides other advantages mentioned, the "compound lumber" is lighter in handling than solid hard wood, easier to work with, and the core furnishes a better bedding for the nails. The prices for compound lumber being below the market price for hard woods, and having so many other advantages over these, seems to warrant the assertion that this new commodity will, before very long, be generally adopted for all such purposes for which it has been designed.

The process of manufacturing the article is as follows: The lumber is bought in the log and brought to the sawmill, where the logs are first trimmed by a large double "circular" and then placed upon automatic veneer saws set to cut the lumber into the necessary thickness required for facing. As fast as this lumber leaves the saws it is placed on trucks and "rattlings" put between each layer. The number of feet and the date when cut is tacked on, and the trucks run out in position to dry, and when sufficiently dried by the air they are run into the kilns. Thus the lumber is always handled in bulk until ready for the machine. After remaining in the kilns about a week the lumber is ready for the factory. The success of the work depends largely upon the proper preparation of the lumber. Having prepared the lumber it is brought into the main factory and cut and trimmed by table saws into proper lengths and width, and is next put through machines similar to Sticker machines, having "cutter heads" with knives adjusted to make the grooves. These knives make 4,000 revolutions per minute, making a tenon and groove about ⅛-in. deep, with the tenon the smallest possible fraction larger than the groove, insuring a tight joint.

After the lumber is grooved the pine base is put through glue machines with revolving brushes, by which the glue is spread evenly over the grooved surface. The hardwood top, being first slightly heated, is then placed on the pine and run through large roller presses having a pressure of 5,000 pounds. This is the last operation, which leaves the lumber ready for manufacture into flooring, wainscoting or other interior house finish of various kinds.

The present plant covers a little over five acres of ground, on which are eight buildings. The land has a river frontage of 900 feet, half of which is docked, and it is expected to bring all raw material by water as soon as the Calumet River has been improved up to this point.

The Detroit River Tunnel.

A board of officers of the Engineer Corps, U. S. A., wae some time ago appointed to make a report upon tht feasibility and approximate cost of a tunnel at Detroit under the Detroit River. The board consisted of General Poe and Majors Adams and Allen. Its report has been presented to Congress. The board estimates that the tunnel is entirely practicable, and that its cost, including approaches and exclusive of land damages, would be about $3,500,000, which is considered about half the cost of a high bridge, which would necessarily be more or less of an obstruction to navigation. There is a bill in Congress authorizing the construction of a tunnel at this point, and it is considered probable that the passage of the bill will be hastened by this favorable report.

Notes Abroad.

It may be interesting to the society to know that I saw sound, solid steel castings of 50 tons weight, also other steel castings of the most intricate description, with metal thick, thin and cored in the same castings, which were entirely sound—articles that cannot be produced in America as yet. I also saw some plate girders for a traveling crane of box section, 60 ft. span, and designed for a concentrated load at the centre of 300 tons. The columns which supported this girder had a base, on the ground, of 10 ft × 6 ft.; the cross section of the column was about 6 ft. × 30 in.; they were of double plate section and heavily ribbed. The building was some 600 ft. × 150 ft. wide, and was designed for a hydraulic forging establishment at the Krupp Works. Two cranes of 150 tons each capacity will run the whole length of the building.

In Bohemia, at Kladnow, some 20 miles from Prague, I saw in operation the Brandt system of hydraulic boring. They were driving a tunnel through hard silurian, the same being, in cross section, 10 ft. 6 in. × 6 ft. 6 in., and the progress made was 100 metres per month. The machines, of which there were two, bored two holes at once, some 2¾ in. in diameter, and 50 in. long without fleeting. The hydraulic pressure for operating the drills was upward of 60 atmospheres.

At the same place I saw the most wonderful pumping machinery that it has ever been my fortune to look upon. One thousand seven hundred ft. below the surface were located two pairs of compound pumping engines, driving double acting plunger pumps of 28-in. stroke for one engine, and 3 ft. stroke for the other, raising the water against the whole head of 1,700 ft., and running at a speed of from 40 to 72 revolutions per minute with entire smoothness. I could not see that it made the slightest difference whether they ran fast or slow as regarded the smoothness of their action. The pumps were the invention of Professor Riedler, of the Polytechnique Institute at Berlin, and his system is coming rapidly into use on the Continent of Europe.

I was very much interested in a visit to the electric lighting plant of the Berlin Co., one of the large stand best equipped in Europe. They have several stations scattered about Berlin, the smallest having some 3,000 H. P. and the largest being arranged for nearly 6,000 H. P. The dynamos are of the ring type, and vary from 3 meters to 5 meters in diameter. They are placed upon the engine shafts, and run at what we should regard as slow speed, the largest size being run 60 revolutions per minute. The potential is but 120 volts, and arc lights are run off at the same circuits of 1,800 candle power. Instead of using insulated cables, the conductors are simple copper bars, varying from 30 to 900 millimetres cross section. These bars are supported by glass insulators in cement tunnels, which are laid under the sidewalks. I expressed surprise that they should use such low voltage and so much copper, but the director of the company told me that it was altogether the best way, on account of its satety, and the great saving in losses by leakage. The Berlin Co. laid 2,000 tons of copper last year, and will lay, the present year, about 3,000 tons; as I understand it about 80,000 tons will be required to completely light the city. I need not tell you that, as a copper man, this was one of the most satisfactory visits that I made.

E. D. Leavitt.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works have recently completed five additional passenger engines for the Alabama Great Southern, three passenger for the Alabama & Vicksburg, and two freight for the Savannah, Americus & Montgomery. It is stated that the Baldwin Works have the contracts for building the locomotives for the road being built between Jaffa and Jerusalem, Palestine.

The New Jersey & New York road last week placed an order with the Rogers Locomotive Works, of Paterson, N. J., for a mogul freight engine, with 19 × 24 cylinders.

The Kansas City, Fort Scott & Memphis expects to receive in a few days the first of an order for ten locomotives placed with Eastern builders.

The Pittsburgh, Fort Wayne & Chicago has received four 10-wheel heavy locomotives to replace four lighter engines transferred to the Little Miami.

CAR BUILDING.

The Pardee Car and Machine Works, of Watsontown, Pa., have just completed the construction of 250 box cars, of 50,000 lbs. capacity, equipped with Westinghouse air brakes and Gould automatic couplers for the Central of New Jersey, and are now constructing a number of the newly designed 60,000-lb. capacity hopper gondola coal cars for the Beech Creek road. These latter cars will also be equipped with the Gould coupler.

The Tacoma & Lake City road has recently received three new passenger cars from the Pullman Car Works.

The Ohio Falls Car Co., of Jeffersonville, Ind., built 155 box cars last week, which is said to be a larger number than was ever before completed by this company in the same time.

The Louisville & Nashville has received a new wrecking car from the Decatur shops.

The Kansas City, Memphis & Birmingham has recently placed in service four new cabooses, and two more will be ready for delivery in a few days.

The Old Colony railroad has just had finished 10 new vestibule cars for the Fall River line.

The property of the Iron Car Co. was attached this week for non-payment of a note for $50,000, and the Huntingdon Mfg. Co. of Huntingdon, Pa., which built nearly all the cars of the company, has also assigned with liabilities of $850,000 in addition to a mortgage for $100,000 and unpaid labor claims of $15,000. The works have been closed. Creditors of the Iron Car Co. holding about $800,000 of the claims against it, are engaged in an amicable reorganization of the company, and have agreed to grant it an extension of from three months to a year to pay its liabilities. The Minsota Car Co., of Duluth, Minn., is also involved in the failure. It is reported that the attachment was obtained in the interest of Mr. Alfred Sully, who became interested in the company in 1886, when George W. Dethridge, at that time his confidential clerk, was made President. The capital stock was increased to $2,500,000. In July, 1887, the American Rolling Stock Co. was organized with a capital of $500,000, and has since been the purchaser, it is said, of the cars made by the Iron Car Co., leasing the cars to railroad companies and issuing car trust bonds to the amount of $3,500,000, which had been sold. Since January $1,200,000 had been issued but not sold, and were pledged as collateral for loans. It is thought the general liabilities are $1,250,000, including the claim of Alfred Sully of $300,000.

The Duluth & Winnipeg has placed an order for passenger equipment with the Barney & Smith Mfg. Co. of Dayton, O., and with the Minnesota Iron Car Co. of West Duluth for freight cars.

BRIDGE BUILDING.

Bellaire, O.—The Ohio Valley road will build an iron bridge on its road with a 150 ft. span.

Birmingham, Ala.—The contract for the construction of the Twenty-first street bridge, recently let to the Smith Bridge Co., of Toledo, O., has been annulled, and new bids have been advertised for. In the first advertisement the only specifications named were the length and width of carriageway and the number and position of piers, each bidder to submit plans. The Smith Bridge Co. was awarded the contract. G. Bouscaren, of Cincinnati, Consulting Engineer, stated that the bridge would not be strong enough. He submitted plans upon which the Smith Bridge Co. bid $40,000. This bid was not accepted, but it was agreed to pay the bridge company for the extra iron used, but a price could not be decided upon, and the contract was then annulled.

Bradford, Pa.—The following bids for the iron superstructure of bridge over the East Branch of Tuna Creek, with a 65-ft. span, were received by the city clerk: Massillon Bridge Co., $2,500, $2,750, $3,000 (plate girder); Variety Iron Works, Cleveland, $2,980; Penn Bridge Co.; $2,990; King Bridge Co., $2,874, $3,276 (plate girder); Berlin Bridge Co., $3,300; Smith Bridge Co., Toledo, $3,200; Groton Bridge Co., $2,940; Youngstown Bridge Co., $3,080; Wallace Iron Works, Jersey City, $2,700.

Bristol, Va.—The city council contemplates, it is reported, building bridges across Beaver Creek at Lee, Moore and Cumberland streets, in Bristol.

Bryson, Tex.—J. A. Buckholts will receive bids until May 19 for the construction of an iron bridge across the Navasota River near Bryson.

Charleston, W. Va.—It is reported that the Chesapeake & Ohio will construct a new bridge across the Kanawha River at Charleston.

Chattanooga, Tenn.—The Chattanooga Coal, Iron & Railway Co. will build a bridge for the Chattanooga Western road across the Cumberland River at the Roane Iron Works.

Cincinnati, O.—The City Engineer is preparing plans and specifications for the Eighth street viaduct, and will advertise for proposals in about 60 days.

Cleburne, Tex.—Johnson County will build an iron bridge across East Buffalo Creek at Cleburne.

Coteau, Que.—The Canada Atlantic bridge at Coteau connecting Coteau and Valleyfield and the Canada Atlantic with the Vermont Central was formally tested last week. The inspecting party consisted of officials of the line, government engineers and Mr. Phelps Johnson, Chief Engineer of the Dominion Bridge Co., of Montreal, who designed the bridge. The testing load consisted of two mogul engines and six platform cars weighing 505,000 lbs. The greatest deflection was three-quarters of an inch at the centre span. The trains have been running over the bridge regularly since it was finished.

Dayton, Or.—A new bridge will be built across the Yamhill River at Dayton.

Dayton, Tenn.—The contract has been awarded to build a bridge across Richland Creek on Railroad street in Dayton.

Harrisburg, Pa.—Cofrode & Saylor, of Pottstown, Pa., have been awarded the contract for the superstructure of the bridge to be built across the Susquehanna River, near Harrisburg, by the Philadelphia & Reading for its Harrisburg Terminal road. The bridge will be nearly 4,500 ft. long, with 23 river spans and viaduct approaches.

The contract of Cofrode & Saylor includes not only the bridge across the Susquehanna River at Harrisburg, but also the approach through the city of Harrisburg, including the iron work and floor, ready for the rails. The approximate amount of iron will be 7,500,000 lbs. The length of approaches, double track, is 1,111 ft. There are 23 river spans, 152½ ft. each centre to centre of piers, single track aggregating 3,507½ ft. long. The rails are 77 ft. above water at the west end of the bridge.

Jefferson, Or.—The contract for the construction of the bridge across the Santiam River, at Jefferson, has been awarded to Messrs. Hoffman & Bates, of Portland, Or., at $11,800.

Kentucky.—The Breathitt City Bridge Co. has been chartered by the state legislature. The legislature has also passed a bill providing for bridges across the Abbott and other rivers in Floyd County.

Knoxville, Tenn.—The contract will probably soon be let by M. Nicholson, City Engineer, for the truss bridge over Second Creek at West Fifth avenue. The length is about 500 ft., roadway 20 ft., one sidewalk 8 ft.; capacity 100 lbs. per square foot all over.

Martinsville, Ind.—The Indianapolis & Vincennes road has contracted for two iron bridges to cross the White river, one east of Martinsville, the other west of that point. Each will have two 140 ft. spans.

McKeesport, Pa.—Ten per cent has been subscribed to the $40,000 capital stock of the company which proposes to erect the Thirteenth avenue bridge over the Youghiogheny river, in McKeesport. Thomas Moore, David Lynch and others are interested.

Minneapolis, Minn.—The City Engineer advertises for bids for building the Larned street bridge. It has one span of 126 ft., two spans of 145 ft. and one span of 80 ft.

Monticello, Miss.—The Columbus Bridge Co. has the contract for rebuilding the bridge at Monticello.

Needles, Cal.—The first train to cross the Atlantic & Pacific cantilever bridge passed over at two o'clock May 10. The formal opening of the bridge will probably occur May 20.

Ottawa.—The directors of the Quebec Bridge Co. have decided upon the plans of the proposed bridge and will soon submit them to the Governor-General-in-Council. As soon as the plans receive his sanction work will be commenced. The site selected is four miles above Ottawa, near the mouth of the Chaudiere River. The directors will renew their application for a subsidy from the Federal Government next year.

Pineville, Ky.—The bridge between Pineville and West Pineville, built by the town of West Pineville has been completed. Another iron bridge is under contract to be built between Pineville and Wahscioto. The Belt Line road will cross Cumberland River in two places and will require two more iron bridges.

Portland, Or.—The Portland Bridge & Building Co. has been organized with a capital stock of $30,000 to do a general bridge building business. George W. Martin, Robert Wakefield and T. D. Warwick are the incorporators.

Salem, Or.—The recent decisions of the county courts of Polk and Marion insure the erection at Salem of the three span steel bridge. Hoffman & Bates, of Portland, have the contract at $71,000. Of the amount $20,000 will be paid by each county and $20,000 by the city of Salem.

Seattle, Wash.—The Terminal Railway & Elevator Co. proposes to build a drawbridge over the Duwamish River and plans are being prepared.

A highway bridge is being built between Fremont and Green Lake at the north side of Lake Union. It will be a pile bridge 10,000 ft. and will cost about $64,000, of which $35,000 has been subscribed by property owners.

Various Projects.—Grant Wilkins, of Atlanta, Ga., has been awarded the contract for building one span of 200 ft. for a bridge over the Etowha River, on the East & West Railroad of Alabama.

The United States Senate has passed a bill authorizing the construction of a bridge over the Bayou Bernard, Miss.

Waynesville, N. C.—Sealed proposals will be received by the Commissioners of Haywood county until June 2, for constructing two piers for an iron bridge to be built across the Pigeon river.

Wheeling, W. Va.—G. P. Bissell, J. B. Thomas, of Boston, Mass., H. E. Russell, of New York City and others have incorporated the Wheeling & Eastern Improvement Co. to build a bridge across the Ohio river. The capital stock is $600,000.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Minnesota, a railroad had operated its line from Chicago to St. Paul about six months when plaintiff was injured by the negligence of a co-employé while operating an engine hauling cars on a temporary track, for the purpose of filling in low-land for a yard at St. Paul. The Supreme Court holds that the railroad could not claim the benefit of a statute exempting a new road, or part thereof, not open to public travel or use, from liability to an employé for injuries sustained through the negligence of a co-employé.[1]

The Federal Court decides that the power given to the S. K. R. Co. to lease its new road gives it no right to lease its line in the Indian Territory.[2]

In New York, the Supreme Court holds that a foreign corporation may be required to construct farm crossings on its line, and the fact that it had constructed a crossing at a remote and inconvenient point is no reason why it should not be required to build one where it is most convenient and useful. Although the right to locate a crossing is with the railroad, the interest and convenience of the owners are to be considered. The railroad was not absolved from liability to build the crossing by the fact that the person who owned the farm at the time the railroad was built had sold it to plaintiff, as the duty to construct the crossing was not owing to the owner as an individual, but to him as the owner of the farm benefited by the crossing, and no release of the obligation to build the crossing had been executed.[3]

In the Federal Court an application was made for a mandamus to compel a railroad to transport the relators' stock in the cars of a certain live stock transportation company. The railroad answered that it had entered into a contract with another transportation company, by which that company was to furnish it a certain number of cars per year; that such cars were available to all shippers of stock; that they were much more useful to it than other live-stock cars, in that they could be converted into coal cars when not used for live-stock; and that it paid mileage for the use of the cars. The court holds that the refusal to transport relators' stock in the cars offered at the same rates charged for stock in the other cars was not an "unjust discrimination" in favor of the transportation company, whose cars the railroad was using. The court also rules that although the interstate commerce act authorizes the court, in its discretion, to grant a *mandamus*, when any question of fact as to the proper compensation of the carrier is raised "notwithstanding such question of fact is undetermined" pending the determination of such question. This does not authorize the court to grant relief where a case of unjust discrimination is not made out.[4]

In Tennessee a railroad agreed to pay complainant, in liquidation of his claim for personal injuries, a certain sum per month for five years, complainant to do such work in the company's shops as he should be called upon to do, and which he might be physically able to do. During the entire time covered by the contract he was not able to work in the shops, but a part of the time he ran a small grocery. The Supreme Court decides in an action to enforce his claim under the contract against the purchasers of the road at foreclosure sale, that it was error to abate complainant's claim by the value of his labor in his own store.[5]

In Minnesota a building contract constituted the plaintiff's chief engineer sole umpire to decide the amount and quantity, character and kind, of work performed and materials furnished under the contract, and stipulated that his decision should be final and conclusive upon both parties. The Supreme Court holds that his decision, in the absence of fraud or such gross mistakes as would imply bad faith, or a failure to exercise an honest judgment, is conclusive.[6]

Carriage of Goods and Injuries to Property.

In Virginia the Court of Appeals rules that equity has jurisdiction to restrain an unlawful interference with the water supply of the depot of a railroad company, whereby the latter is obliged, either to provide water for drinking and other purposes, at heavy and continual expense and inconvenience, or to have its water-closet closed or used without water, at the risk of becoming a nuisance, as this is an irreparable damage for which there is no adequate remedy at law.[7]

In Connecticut the Court of Errors decides that the statutes, which require a railroad company to fence its tracks, "except at such points as the railroad commissioners shall adjudge unnecessary," and which make it liable to any one suffering injury by its failure to so fence, do not make a company liable for injuries to a horse which came upon the track at an unfenced point, where it was paralleled by the tracks of another company some 50 ft. distant, though the commissioners had never adjudged a fence to be unnecessary at that point.[8]

In Arkansas the Supreme Court rules that the extent of the duty of a railroad as to stock on its track is that the engineer shall use reasonable care, after the stock is discovered by him, to prevent injury to it, and it is error to charge that that it is negligence for a railroad company to fail to keep a lookout for stock.[9]

In Minnesota the Supreme Court decides that where cattle at the time they escaped upon a track and were killed were running at large in violation of the law, and the cattle-guard was not in an unlawful or forbidden condition, the railroad's servants, engaged in operating its trains, were not bound to anticipate such trespassing by looking ahead, or by managing a train with reference to such a contingency.[10]

In New York in an action against a railroad for negligently setting fire to woods on plaintiff's land lying near defendant's track, it appeared that defendant allowed combustible material to accumulate along its track, and that the fire originated therein shortly after a train passed. As the train went by the place where the fire began, witnesses stated that the smoke and sparks poured from the engine thickly; the sparks being larger than usual. It did not appear that the engine was not properly provided with a spark arrester, or that it was out of order or mismanaged. The Court of Appeals holds the railroad liable.[11]

Injuries to Passengers, Employes and Strangers.

In New York the Supreme Court rules that where the agent of a railroad checks the baggage of a passenger over a different route from the one agreed on, and it is injured while on such route, the company is liable as an insurer.[12]

In North Carolina the Supreme Court holds that a conductor may refuse to accept fare after the train has been stopped to eject the passenger for non-payment, and may again eject him if he return to the train.[13]

In New York the Court of Appeals decides that where in an action for an assault and battery for forcibly removing plaintiff from a car, the defense is that plaintiff refused to pay the additional fare required by a regulation of the company for packages too large to be carried on a passenger's lap without incommoding others, it is for the jury to determine whether two parcels, 20 by 24 inches in size, are within the purview of the regulation.[14]

In Georgia the Supreme Court rules that the failure of an employé to extricate himself from a perilous situation brought on by the negligence of a co-employé, when he could do so by the use of ordinary care, will bar his right to recover.[15]

In Minnesota the Supreme Court holds that one employed as a brakeman on a section of four miles of railroad, and notified that there were stone piles beside the road, and so near to it that a person on the side of a car passing them would be struck, assumes the risk from that cause, although the precise location of the stone piles was not stated to him.[16]

The Supreme Court of the United States rules that in an action against a railroad for breach of a contract to carry plaintiff, which contract was contained in a ticket accepted and signed by plaintiff, evidence as to when he first knew of a condition contained in it is immaterial, as he is bound by the conditions, whether he read them or not.[17]

In Texas the Supreme Court rules that the liability of a railroad for exemplary damages does not depend on its ability to keep its road in such condition that it can be safely operated.[18]

In Georgia a switchman was charged with the duty of giving signals to the engineer as to slackening speed. While standing on top of a moving car, the engineer suddenly slackened speed without any signal having been given by the switchman, who was thrown

to the ground. He testified that he had never known the engine to stop without signals.

The Supreme Court held the railroad liable.[19]

In Virginia, a man had been employed for several months as a section hand, and on the night of the accident had been detailed as a watchman, and instructed to walk back and forth between two points on the tracks. While doing so, he mounted a passing engine, which the rules forbade. Copies of these rules were distributed among the section foremen. The Court of Appeals decides that he was charged with notice of the rules, and, being on the engine contrary to these rules and to his instructions, he could not recover for injuries caused by an accident to the engine, and it was immaterial whether or not his getting on the engine was objected to by those in charge.[20]

In the Federal court it is ruled that it is not contributory negligence for a switchman to ride on the front foot-board of the switch engine to which he is attached while en route to the work he has to do.[21]

In New York, in an action for the killing of an engineer in a collision, it appeared that the train dispatcher had ordered an operator at a certain station to "flag and hold" decedent, but that, in consequence of his mistake in supposing that a later order had superseded the former one, he removed the flag and the collision thereby resulted. The operator had performed his duties properly for three or four months, and was of good intelligence, but he was only 17 years old. The Supreme Court holds that the question of his competency was for the jury.[22]

In Louisiana the Supreme Court rules that it is negligence in running accommodation trains through a city to a fair ground in the suburbs, where large numbers of people congregate around the station, to use an inferior locomotive, run by a fireman instead of a skilled engineer, and to run its trains at a dangerous speed in approaching the station.[23]

In Tennessee, the Supreme Court holds that in a statute providing that "on approaching a city or town the bell or whistle shall be sounded when the train is at the distance of one mile, and, at short intervals, until it reaches the depot or station; and on leaving a town or city the bell or whistle shall be sounded when the train starts, and at intervals until it has left the corporate limits," the word "town" in the first part of the section includes only incorporated towns.[24]

[19] Schneider v. C. & N. R. Co., 43 N W. Rep., 783.
[20] Briscoe v. S. K. R. Co., 40 Fed. Rep., 273.
[21] Buffalo S. & C. Co. v. D. L. & W. R. Co., 7 N. Y. (Supp.), 604.
[22] United States v. Delaware, L. & W. R. Co., 40 Fed. Rep., 101.
[23] Frazer v. E. T. V. & G. R. Co., 12 S. W. Rep., 537.
[24] St. Paul & N. P. R. Co. v. Bradbury, 44 N. W. Rep., 1.
[25] Diffendal v. V. M. R. Co., 10 S. E. Rep., 536.
[26] Gallagher v. N. Y. & N. E. R. R. Co., 18 Atl. Rep , 786.
[27] M. & L. R. Co. v. Kerr, 12 S. W. Rep., 329.
[28] Stacy v. W. & St. P. R. Co., 43 N. W. Rep., 905.
[29] O'Neill v. N. Y. O. & W. R. Co., 22 N. E. Rep., 217.
[30] Estes v. St P., M. & M. R. Co. 7, N. Y. (Supp.) 863.
[31] Pickens v. R. & D. R. Co., 10 S. E. Rep., 555.
[32] Morris v. A. A. R. Co. 22 N. E. Rep , 1097.
[33] Parker v. Geo. Pac. R. Co., 10 S. E., 233.
[34] Smith v. W. & St. P. R. Co., 45 N. W. Rep., 968.
[35] Boylan v. Hot Spring R. Co., 10 S. C. Rep., 50.
[36] Texas Trunk R. Co. v. Johnson, 12 S. W. Rep., 482.
[37] Cent. R. & B. Co. v. Dickson, 10 S. E. Rep., 203.
[38] S. V. R. Co. v. Lucado, 10 S. E. Rep., 422.
[39] Lockhart v. L., R. & M. R. Co., 40 Fed. Rep., 631.
[40] Sutherland v. T. & B. Co , 8 N Y. (Supp.), 83.
[41] Pey on v. T. & P. R. Co., 6 South. Rep., 690
[42] Webb v. East Tenn., V. & G. Ry. Co., 12 S. W. Rep., 428.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Cleveland & Pittsburgh, quarterly, 1¾ per cent., payable June 2.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 27.

Canada Southern, annual, St. Thomas, Ont., June 4.

Carolina Central, special, Florence House, New York City, May 21.

Chicago, Burlington & Quincy, annual, Chicago, Ill., May 21.

Chicago & Eastern Illinois, annual, Chicago, Ill., June 4.

Chicago & Northwestern, annual, Chicago, Ill., June 5.

Chicago, Rock Island & Pacific, annual, Chicago, Ill., June 4.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 7.

Denver & Rio Grande, annual, Denver, Col., May 27.

Des Moines & Fort Dodge, annual, Des Moines, Ia., June 5.

Jeffersonville, Madison & Indianapolis, annual, Louisville, Ky., May 21.

Louisville, New Orleans & Texas, special, Memphis Tenn., June 5.

Middletown, Unionville & Water Gap, annual, New York City, May 26.

Milwaukee, Lake Shore & Western, annual, Milwaukee, Wis., June 11.

Missouri, Kansas & Texas, annual, Parsons, Tex., May 21.

New York & Harlem, annual, Grand Central Depot, New York City, May 20.

Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 21.

St. Joseph & Grand Island, annual, Elwood, Kan., June 10.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 2.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railway Station Agents' Association* will hold its next annual convention at Cleveland, O., May21.

The *Master Car Builders' Association* will hold its next annual convention at Old Point Comfort, Va., June 10. Rooms should be secured of Mr. F. N. Pike, manager, Hygeia Hotel, Fortress Monroe, Va.

The *American Railway Master Mechanics' Association* will hold its next annual convention at Old Point Comfort, Va., beginning June 17.

The *International Association of Car Accountants* will hold its fifteenth annual convention at the Hotel Brunswick, New York City, June 24, 25 and 26.

The *Association of American Railway Accounting Officers* will hold its next annual meeting at the Stockton Hotel, Cape May, N. J., July 9.

The *National Association of General Baggage Agents* will hold its next annual convention at Chicago, Ill., July 16.

The *Traveling Passenger Agents' Association* will hold its next annual convention at Buffalo, N. Y., August 19.

The *New England Roadmasters' Association* will hold its eighth annual meeting at Boston, Mass., Aug. 20 and 21.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Saturday following the second Wednesday of each month at 7:30 p. m. in the director's room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Institute of Electrical Engineers.

The annual meeting and election of the Institute will be held at the house of the American Society of Civil Engineers, Tuesday evening, May 20.

Engineering Association of the Southwest.

The regular meeting of the association will be held at the Young Men's Christian Association building, Nashville, Tenn., May 8. A paper was read on "The Recent Duty Tests of the Holly-Gaskill Pumping Engine of the Nashville Waterworks," by Mr. George Reyer, Superintendent of Water-Works, Nashville.

Engineers' Club of St. Louis.

A regular meeting was held May 7, 1890, President Nipher in the chair; thirty-nine members and four visitors present.

Prof. Arthur T. Woods, of Champaign, Ill., addressed the club on "Compound Locomotives." He distributed blue prints showing characteristic indicator cards, and also a tabulated statement of dimensions of certain standard types of compound locomotives. Of 500 now in operation, but a small number were in use in the United States. The number was rapidly increasing. He stated that the economy in fuel over single cylinder engines was found to vary from 13 to 24 per cent., and that the average of a large number of tests extending over a considerable length of time showed a saving of 18¼ per cent. Another important advantage was that it was not necessary to force the boiler, it being therefore possible to secure better combustion. It was necessary that the locomotive be designed particularly for the work in hand, in order to secure the best results. In the writer's opinion, the compound locomotive has come to stay. Messrs. Bryan, Johnson and Nipher took part in the discussion.

Mr. Otto Schmitz then read a paper on "Granitoid Curb and Gutter." He explained the conditions of service, and gave interesting data regarding some extensive work of this kind just completed in this city. Particulars were given of the composition of the granitoid, the kind of cement used, tests required, etc. Messrs. Bruner, Johnson, Blaisdell, Clark, Hovey and Pitzman took part in the discussion.

The special order of the day was taken up, being the consideration of the report of the committee on affiliation with the American Society. The report is in part as follows:

AFFILIATION OF SOCIETIES.

Your special committee on the Affiliation of the Engineer Societies considers that the subject of a closer affiliation has now been sufficiently discussed to justify us in submitting, for your consideration, the outlines of a plan which seems to us to approach the practicable.

The existing national societies of civil, mining, mechanical and electrical engineers have come into existence because their promoters felt a want not fully met by the liberal constitutional provision of the first-named society, by which all of these several classes are eligible to membership. This shows that persons pursuing like lines of work desire to get together by themselves, at least occasionally. The local organizations find the reason for their existence in the gain, social and professional, which comes from contract between persons whose pursuits have something in common, but which do not run parallel. No proposition which looks to the abandonment of either of these two classes of organization, or which will hinder their growth, is worthy of their consideration.

The American Society of Civil Engineers, which is the oldest of its class in this country, and has retained in its constitution the catholic tradition of its name, is the best nucleus for a general organization. This society has the farther advantage of having in its membership already representatives of all classes of engineers. We therefore, in outlining a plan of co-operation, assume the American Society of Civil Engineers as the centre.

Probably the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the American Institute of Electrical Engineers will prefer to maintain a separate position as now. The most that can be looked for is co-operation in the matters of headquarters, offices building, library and publications.

Of necessity local organizations must be allowed freedom in the management of their own affairs, particularly as to property acquired, dues and conditions of membership.

We propose as an outline of a scheme:

1. To confer upon any body or organization of engineers, one-fifth of whose members are connected with the American Society of Civil Engineers (provided said number shall not be less than 10), the privilege of publishing its papers with those of the American Society, and of becoming, in a certain restricted sense, a branch, or chapter, of that society, conditioned only upon the adoption of constitutions and by-laws in harmony with those of the American Society of Civil Engineers, and the observance of certain stipulations.

2. Such bodies to be independent of each other, being represented in the central society, indirectly only, by such of their number as are also members of the American Society of Civil Engineers. They shall be self-governing in all matters pertaining to local membership, dues and expenditures other than a subscription to the publications of the American Society of Civil Engineers, at rates fixed to cover the cost of publication and a reasonable proportion of general expenses, which subscription shall be collected by the local body and paid into the American Society treasury annually in advance, or substantially the same as is now done through the Association of Engineer Societies.

3. Professional papers submitted to the branches, and other suitable matter, shall be published by the American Society, under the same rules and restrictions as are provided for like matter originating in the American Society.

4. As the presentation of papers in either of the affiliated clubs would be a virtual presentation to the American Society, the semi-monthly meetings of the members of the society resident in New York would be in effect meetings of a local section only; with no greater importance than is given them by the number and character of those in attendance. It would, in fact, be well to provide that the American Society as such should hold but two meetings in each year, one of them to be held in the city of New York and the other at any other place which may be selected. At these meetings all business affecting the general interests of the society should be transacted, whilst all routine business should be conducted by an enlarged board of directors.

To make more definite the steps to be taken to bring about the proposed union of publications, we suggest the following as the form of a constitutional provision to be adopted by the American Society:

Any professional society or organization of engineers now or hereafter formed may become associated with the society for the publication of professional papers upon the following terms and conditions:

A. Such association must consist of not less than twenty-five persons, not under twenty-five years of age, who are eligible as members, associates or juniors of this society, and of whom not less than ten shall be, or become, members or associates thereof.

B. Such association must have completed its organization, by the adoption of a name, which shall not contain the corporate name of this society; by the adoption of a proper constitution and by-laws; by fixing the conditions of its membership and by electing the necessary officers.

D. Application [for association] shall be submitted to a letter ballot of this society, and, if receiving a majority of the votes cast, shall be granted.

F. No professional papers shall be published under the name of a branch except through this society.

G. Any organization having associated itself with the society under the preceding provisions may withdraw from such connection by discharging its obligation in full and giving notice to the secretary of this society of its purpose to withdraw; or for the failure of the associated club to comply with its obligations, to this society, its connection herewith may be dissolved by the board of direction by a two-thirds vote, provided that, after notice from the board of direction of its default, the said club shall for three months fail to remedy its default.

ROBT. MOORE,
ROBERT E. MCMATH,
JAMES A. SEDDON, } Committee.

After discussion it was on vote ordered that the recommendation of the committee be adopted as the sentiment of the club. The secretary was directed to inform the American Society and local societies of this action.

Massachusetts Institute of Technology.

A general meeting for the reading and discussion of professional papers will be held in Boston, May 21, at the new building corner of Boylston and Clarendon streets. The meeting will be largely devoted to the discussion of papers on various applications of electricity.

New England Railroad Club.

At the meeting of May 14, the club adjourned to the second Wednesday in September.

The Secretary was instructed to get rates of fare for the members to Old Point Comfort, with a view to attendance at the Conventions.

Order of Railway Conductors.

The National Convention of the Order of Railway Conductors met in Rochester, N. Y., May 13. A public reception was given the delegates at the Lyceum Theatre. Secretary of State Frank Rice delivered the address. Mayor Carroll welcomed the conductors to the city. There are over 1,000 delegates, and the convention will remain in session about a week. Press despatches say that on Wednesday it was decided by a vote of 210 to 65 to eliminate the provision of the constitution prohibiting strikes. The Western men carried the day against the conservatives, who were led by Mr. Wheaton.

Western Railway Club.

The Western Railway Club will hold its next meeting on Tuesday, May 20, at 2 p. m., in its new rooms, 850 and 854 Rookery Building, southeast corner Adams and La Salle streets, Chicago.

The subjects for discussion are:

"The Counterbalancing of Locomotives." The discussion will be based upon the propositions advanced at the last meeting. [See April proceedings.] And "Journal Boxes."

The following topics are announced for brief discussion:

"Relative Cost of Maintaining Rigid Centre and Swing Centre Bearing Trucks on Freight Cars," "What Has Been Observed as to Comparative Flange Wear of Wheels."

Western Society of Civil Engineers.

A regular meeting was held in Chicago, May 7. The principal paper and discussion at the meeting was on the Chicago railroad problem. At the last meeting a committee was appointed to prepare a brief statement of the present conditions. This committee presented a majority and a minority report. The majority, Messrs. Wallace, Randolph and Alexander, suggested for consideration: (1) A complete elevated system; (2) a complete depressed system; (3) a combination of the two. The minority re port, by Messrs. George S. Morrison and

C. L. Strobel, recommended only the combined system. Letters were read from Mr. H. H. Porter and Mr. E. St. John. Mr. Porter thought that the solution of the problem would be found in a combination of viaducts and tunnels. The tracks in the city must be kept as much as possible on a level with the streets. Mr. Porter suggested that it might be possible to make the traffic pay a little higher tariff to compensate in some measure for the great expense of bringing the tracks into the city. There was considerable discussion and the topic was continued to another meeting.

A resolution was adopted indorsing the movement of the Engineers' Club of St. Louis to erect a monument to the late Captain Eads.

PERSONAL.

— Mr. J. Howard Roop has been elected President of the Chester Rolling Mill Co., of Chester, Pa.

—Mr. J. H. Lawder has resigned the office of General Western Agent of the Texas & Pacific system to engage in private business.

— Mr. Thomas H. Stryker has been elected President of the New York Locomotive Works, of Rome, N. Y., to succeed the late Mr. Thomas G. Nock.

—Mr. A. S. Crane, for the last six years General Freight Agent of the Chicago & Atlantic Road, has resigned to accept a similar position with the Fitchburg road.

—Mr. C. H. McKibben, General Purchasing Agent of the Union Pacific, has resigned that position and has been succeeded by Mr. L. S. Anderson, Assistant Secretary.

—Mr. Elliott T. Monett, New York State Agent of the Wabash, with headquarters in Syracuse the past two years, has been appointed Eastern Agent of the same road, with office in New York City.

—Mr. John W. Cloud, Secretary of the M. C. B. Association, has been appointed Western representative for the Westinghouse Air Brake Co. He will resign the secretaryship, and will remove from Buffalo to Chicago after the June convention.

— Col. J. W. Sloss, a pioneer iron manufacturer of Birmingham, Ala., died May 4 of heart failure, aged 70 years. He built a number of furnaces, developed coal and iron mines and organized the Sloss Steel & Iron Co., the second largest corporation in the South. He retired about a year ago, leaving his business in the hands of his three sons.

—Mr. Joseph K. Choate, Superintendent of the Colorado division of the Union Pacific, has resigned and it is reported will be succeeded by R. J. Duncan, General Superintendent of the Fort Worth & Denver City. Mr. Choate has been in railroad service since 1881 in the engineering and operating departments of several Eastern and Western roads, and has been Superintendent of the Union Pacific's Colorado division since Nov. 1, 1885.

ELECTIONS AND APPOINTMENTS.

Anniston & Atlantic.—The following officers and directors were elected at the annual meeting of the road at Anniston, Ala., May 2: President, A. L. Tyler; Vice-President, T. K. Scott; Secretary and Treasurer, A. L. Tyler, Jr.; S. E. Noble, S. B. Trapp, J. B. Knox and H. A. Reynolds, Anniston; Capt. T. S. Plowman and S. J Bowie, Talladega, Ala.

Anniston & Cincinnati.—At the annual meeting of the road, held in Anniston, Ala., May 2, the following officers and directors were elected: President, A. L. Tyler; Vice-President, T. K. Scott; Secretary and Treasurer, A. L. Tyler, Jr.; S. E. Noble, S. B. Trapp; J. B. Knox, H. A. Reynolds, Anniston; Col. R. B. Kyle and Col. W. H. Denson, Gadsden, Ala.

Atchison, Topeka & Santa Fe.—At the annual meeting of the stockholders of the road in Topeka, Kan., May 8, 545,440 shares out of a total of 750,000 shares were represented. The only change in the Board of Directors is the substitution of Levi C. Wade, President of the Mexican Central, for F. E. Peabody. The following officers were elected: George C. Magoun, Chairman of the board; Allen Manvel, President; J. W. Reinhart, First Vice-President, in charge of financial and accounting affairs; A. A. Robinson, Second Vice-President, in charge of operating affairs; J. F. Goddard, Third Vice-President, in charge of traffic affairs, and Edward Wilder, Secretary and Treasurer. The fiscal year of the company was changed to expire June 30 instead of Dec. 31, and the annual meeting was changed from May to October to conform to the change in the fiscal year.

Austin & Northwestern.—At the annual meeting held at Austin, Tex., May 7, the company elected J. Collett, New York, President; John Hancock, Austin, Vice-President; A. P. Wooldridge, Austin, and W. B. Isham, New York, Treasurers; A. N. Lietmaker, Superintendent, and A. L. Rhomberg, Secretary.

Beauharnois Junction.—The annual meeting of shareholders of the company was held in Montreal, May 6, and the following were elected directors, viz.: Sir Joseph Hickson, William Wainwright, Hon. Henry Starnes, S. W. Foster, Moise Branchsud, E. H. Bisson and Julien Hebert. Sir Joseph Hickson was elected President and W. Wainwright Vice-President.

Berlin.—The following directors were elected at the annual meeting of the stockholders, held in Pittsburgh, Pa., May 5: President, J. B. Washington, Pittsburgh; Secretary, A. W. Black, Pittsburgh; Treasurer, W. H. Ijams, Baltimore, Md.; Robert Garrett, Baltimore, Md.; W. H. Koontz, Somerset, Pa.; S. A. Philson, Berlin; J. V. Patton, Pittsburgh.

Birmingham & Jones Valley.—The incorporators of this Alabama road are: Charles M. Shelley, E. Gerry Stevens, Jr., C. M. Boulden, and James H. G. Martin, of Birmingham, Ala., and Edmund W. Booker, of Uniontown, Ala.

Burlington, Cedar Rapids & Northern.—The annual meeting of the leased lines of the company comprising the Cedar Rapids, Iowa Falls & Northwestern, Iowa City & Eastern, Cedar Rapids & Clinton, Chicago, Decorah & Minnesota companies, were held at Cedar Rapids, April 7. The followiag officers were elected for each company, with the exception of H. H. Hollister, who was elected Treasurer of the Chicago, Decorah & Minnesota; C. J. Ives, President and General Manager; J. C. Broeksmit, Vice-President; W. P. Brady, Secretary; S. S. Dorwart, Treasurer; H. F. White, Chief Engineer.

Central of Georgia.—Robert Pace has been appointed Assistant Purchasing Agent, with office in Savannah, to succeed W. D. Thomas resigned. L. W. Collier has been appointed General Agent in Atlanta in place of Charles Harman, who succeeds Alton Angier as General Passenger Agent of the Western & Atlantic. Henry B. Byrne, Assistant Freight Agent of the Alabama Great Southern, has been appointed Traveling Freight Agent of the Savannah & Western, to succeed L. W. Collier, promoted.

Central of New Jersey.—The annual meeting of the stockholders of the company was held at Communipaw, N. J., May 9. The following directors were elected: Austin Corbin, Charles Lanier, Harris C. Fahnestock, J. Rogers Maxwell, James A. Garland, George F. Baker, Edward D. Adams, Henry Graves and Henry W. Maxwell. The Board of Directors re-elected the officers as follows: President, J. Rogers Maxwell; Treasurer, John W. Watson, and Secretary, Samuel Knox.

Chicago & West Michigan.—The office of F. C. Robinson, Master Mechanic, is at Muskegon, Mich., instead of Grand Rapids, as reported.

Columbia, Geneva & Western.—The incorporators are: John T. Davis, W. C. Koonce, J. I. Darby, J. S. Koonce, A. D. Wood, A. A. Jones, and Harrison Purcell. The capital stock is fixed at $275,000.

Columbus, Hocking Valley & Toledo.—John S. Patterson has resigned at Superintendent of Motive Power of the road, and has been succeeded by William Miller, of the St. Louis, Vandalia & Terre Haute.

Columbus, Lima & Milwaukee.—The stockholders elected the following directors at a meeting held at Lima, O., May 5: B. C. Faurot, F. L. Langan, D. J. Cable, F. P. Graf, E. P. Hooker, L. C. Newson and H. Sabine, of Columbus, O.; L. Strong, of New Hampshire, and M. Markle, of Detroit. The board elected B. C. Faurot, President; L. C. Newson, Vice-President; F. P. Graf, Secretary, and D. J. Cable, General Counsel.

Dayton, Hocking Valley & Eastern.—This company was recently incorporated in Ohio by R. D. Marshall, John McIntyre, Frank T. Huffman, Charles E. Drury and Jacob Luixweller, Jr., and N. P. Ramsey. At a meeting of the directors in Dayton, R. D. Marshall was elected President and N. P. Ramsey Secretary.

Delaware & Round Brook.—The company held its annual meeting in Trenton, N. J., May 8. and elected the following Board of Directors: Edward C. Knight, of Philadelphia, President; John H. Michener and William Massey, Philadelphia; Chay. S. Bayliss, New York; George Richards, Dover, N. J.; Lewis H. Taylor, Highbridge, N. J.; William Mershon, Rahway, N. J.; Samuel K. Wilson, A. G. Richey and Isaac Richey, Trenton; Frederick Beach, Dover; Edward C. Knight, Jr., and Henry Lewis, Philadelphia.

Delaware & Hudson Canal.—The annual meeting of the company was held in New York City, May 13, and the following Board of Directors was elected: Le Grand B. Cannon, James Roosevelt, Robert M. Olyphant, Benjamin H. Bristow, John A. Stewart, Frederick Billings, R. Suydam Grant, William H. Tillinghast, Johnston Livingston, Alfred Van Santvoord, George C. Clark, William W. Astor, and James A. Roosevelt. W. W. Astor takes the place of John Jacob Astor, and James A. Roosevelt succeeds David Dows, both deceased.

Duluth & Winnipeg.—J. J. McManus has been appointed Superintendent of the road.

Elmira & Lake Ontario.—The road elected the following Board of Directors at its annual meeting: G. B Roberts, Frank Thomson, A. J. Cassatt, Wistar Morris, J. N. Hutchinson, George Small, B. F. Newcomer, John P. Green, J. N. DuBarry, E. B. Parsons, John S. Leib, Stephen W. White, James P. Kerr.

Grand Rapids & Indiana.—John H. K. Burgwin has been appointed Roadmaster of the Northern Division of the road, with headquarters at Grand Rapids.

Greenville, Nashville & Chattanooga. — The following are the officers of this road: President, J. H. Hackett, St. Louis, Mo.; Vice-President, John H. Rice, Fort Scott, Kan.; Secretary, F. L. Bates, Greenville, Miss.

Joplin & Western.—S. H. H. Clark, George C. Smith, D. S. H. Smith, E. G. Merriam, and W. H. Phelps, are the directors of this Missouri road.

Louisiana & Missouri River.—The following directors were elected at the annual meeting held in St. Louis, Mo., May 7: Bradley D. Lee, John J. Mitchell, R. P. Tansey, E. Smith and John P. Ellis, of St. Louis, and Henry Cabot Lodge, of Boston, Mass. The only changes were that Bradley D. Lee was chosen in place of W. H. Bliss and John P. Ellis, of A. B. Silsbee. The following officers were elected: Bradley D. Lee, President; R. P. Tansey, Vice-President; Charles H. Foster, Secretary and Treasurer, and F. A. Wann, Assistant Secretary.

Macon & Dublin.—At the annual meeting of the stockholders of this road held at Dublin, Ga., May 9, the following directors were elected: I. G. Gates, D. M. Hughes, J. W. Walker, Twiggs County; D. G. Hughes and H. S. Morse, Bibb County; J. M. Stubbs, Laurens County. The following officers were elected; D. M. Hughes, President; H. I. Morse, Vice-President; Hardy Smith, of Dublin, Secretary and Treasurer.

Michigan Central.—At the annual meeting of the stockholders in Detroit, May 8, the old Board of Directors was re-elected.

New Jersey & New York.—The annual meeting of the company was held in Jersey City May 5. The old board of directors and officers were re-elected.

New Orleans & Gulf.—M. R. Spelman, General Manager, has been appointed Receiver in a suit brought by the Central Trust Co., of New York.

New York Central & Hudson River.—James S. Cark has been appointed General Agent of the Passenger Department and will have supervision of the local passenger business. His office will be at Grand Central station.

New York, Lake Erie & Western.—W. J. Holmes, Superintendent of Telegraph of the Erie division, has been appointed Superintendent of Telegraph of the New York, Pennsylvania & Ohio, vice J. B. Shaw, resigned. His office will be at Cleveland, O.

Norfolk & Western.—At the recent annual meeting in Norfolk, Va., the old Board of Directors was re-elected and the following officers: F. J. Kimball, President; Charles G. Eddy, Vice-President; A. J. Hemphill, Secretary, and W. G. MacDowell, Treasurer.

North Pacific Coast.—The directors of this road are: John W. Coleman, W. Steel, W. Young, W. R. Fortune, A. Borel, C. Deneraud and J. R. Mackie.

Ohio River.—The annual meeting of the stockholders of the road was held in Parkersburg, W. Va., and the following directors were elected: E. W. Clark and S. W Colston, Jr., Philadelphia, Pa.; J. G. Fair, San Francisco; Charles Prett, Col. W. P. Thompson and Col. O. H. Payne, New York; Charles W. Harkness, Cleveland, O.; J. N. Camden, George W. Thompson, W. N. Chancellor, J. B. Neal, J. N. Camden, Jr., and R. H. Browse, of Parkersburg. The Board elected the following officers: President, George W. Thompson; Secretary, W. N. Chancellor; Auditor, E. W. Warnick; Treasurer, W. L. Trenor.

Oregonian.—The reorganization of this company has been completed, and these officers have been elected: President, T. E. Stillman, New York; Vice-President, Richard Koehler, Portland; Secretary, W. W. Brethertон; Treasurer, George H. Andrews; General Superintendent, C. N. Scott; Engineer, A. O. Eckleston. Several extensions are projected.

Ottawa & Parry Sound.—The annual meeting of the shareholders of the road was held May 11. The directors elected officers: J. R. Booth, President, and C. McLachlin, of Armprior, Vice-President.

Pawtuxet Valley.—The stockholders of the company met in Providence, R. I., May 8, and elected these directors: Henry Howard, Jonathan Chace, R. G. Howland, E. T. Child, J. H. Chase, Henry F. Brown and Wm. H. Pope.

Richmond & Danville.—C. E. Shober, Traveling Passenger Agent at Montgomery, Ala., having resigned, John Metcalfe has been appointed Traveling Passenger Agent, with office at Montgomery.

St. Joseph, St. Louis & Santa Fe.—The present officers of this road were re-elected at the recent annual meeting, the office of First Vice-President, left vacant by the death of Col. Wenslow Judson, was not filled.

St. Joseph Terminal.—E. McNeill, General Manager of the St. Joseph & Grand Island, has been elected President of this company, vice Winslow Judson, deceased. W. D. B. Matter has been chosen Vice-President.

St. Louis, Kansas City & Colorado.—The stockholders of the company held their annual meeting at Fort Scott, Kan., May 8, and reelected the following Directors: George C. Magoun, William Libbry, and J. J. McCook, of New York; A. Manvel, Chicago; C. H. Osburn, Fort Scott; J. H. Sturgeon and S. T. Emerson, St. Louis; John C. Carpenter and T. C. Jones, Chanute, Kan. The Directors chose the following officers: A. Manvel, of Chicago, President; J. A. Reinhart, Boston, Vice President and General Auditor; J. J. McCook, New York, General Counsel; S. R. Peck, Topeka, Kan., General Solicitor; John Gallup, Jr., St. Louis, Secretary and Treasurer and Auditor; George S. Goodwin, Boston, Assistant Secretary and Treasurer; J. P. Whitehead, Boston, Controller; S. T. Emerson, St. Louis, Chief Engineer and Superintendent.

St. Louis & San Francisco.—The following directors were unanimously elected at the annual meeting in St. Louis, May 14: George Coppell, Walter L. Frost, Isaac E. Gates, George J. Gould, Brice Gray, Collis P. Huntington, Henry K. McHarg, Henry L. Morrill, Horace Porter, Jesse Seligman, Russell Sage, Henry Seligman and Edward F. Winslow. Of these H. K. McHarg, H. L. Morrill and Henry Seligman are new directors, succeeding John Paton, William F. Buckley, and John O'Day.

Salisbury.—The company elected the following directors at the annual meeting recently held in Pittsburg, Pa.: President, J. V. Patton, Pittsburgh; Secretary and Treasurer, J. B. Washington, Pittsburgh; J. B. Jackson, John McCleave, W. T. Manning, C. S. Wight, Chas. Donnelly, J. M. Schoonmaker, Pittsburgh; Thomas M. Bayne, Allegheny; Francis Burns, Baltimore, Md.

Shenandoah Valley.—The stockholders held their annual meeting at Roanoke, Va., May 9. The following officers were elected: Vice-President, Col. Upton L. Boyce, of Boyce, Va.; Secretary and Treasurer, G. R. W. Armes, of Philadelphia, Pa.; General Counsel, Hon. W. H. Travers, of Philadelphia; Directors, Clarence H. Clark, J. J. Martin, George C. Wood, Edward C. Clark, Charles Hacker, D. W. Flickwir, F. J. Kimball, Upton L. Boyce, G. R. W. Armes, A. R. Boteler, Henry B. Davenport, W. H. Travers and John T. Lowell.

Sherman, Denison & Dallas.—The following are the officers of this road: President, C. H. Osbun, Fort Scott, Kan.; Secretary and Treasurer, A. T. Drew, Denison, Tex.; and Chief Engineer, George M. Jarvis, Denison, Tex.

Somerset & Cambria.—At the annual meeting of the road held in Pittsburgh, Pa., May 5, the following directors were elected: President, J. P. Washington, Pittsburgh; Secretary, A. W. Black, Pittsburgh; Treasurer, W. H. Ijams, Baltimore, Md.; W. H. Koontz, Somerset; J. V. Patton, W. T. Manning, C. S. Wight, Pittsburgh; Robert Garrett, Baltimore, Md.; Mord Lewis, Clarksburg, W. Va.

Texas Trunk.—At the annual meeting of the Texas Trunk line in Dallas, Tex., May 9, the following officers were elected: S. W. Kneeland, President; J. E. Schneider, Vice-President; W. G. Mory, General Manager and Treasurer; P. A. Tucker, General Freight and Passenger Agent; J. D. Trammell, Superintendent. The old Board of Directors was re-elected.

Thomasville, Silver Valley & Pee Dee. — At a recent meeting of the road held in Thomasville, N. C., John S. Cramer was elected President and J. H. Lambeth, Secretary.

Toledo & Ohio Northern.—The following Board of Directors has been elected: Cornelius Vanderbilt, F. W. Vanderbilt, William K. Vanderbilt, John Newell, D. P. Eells, J. H. Wade, P. P. Wright, E. D. Potter, Jr., and C. P. Leland. Mr. Newell has been elected President and C. P. Leland Secretary and Treasurer.

Union Pacific.—L. S. Anderson has been appointed to succeed C. H. McKibben, resigned. R. J. Duncan has been appointed to succeed J. K. Choate as Superintendent of the Colorado division.

Ware River.—At the annual meeting of the road held at Palmer, Mass., May 7, directors were elected as follows: James A. Rumrill, Springfield, President; C. A. Stevens, Ware, Mass.; E. B. Gillett, Westfield; C. A. Stephens, Hingham; H. B. Claflin, Boston; C. P. Sargent, Brookline.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Baltimore & Drum Point.—Rodgers & Clement, contractors for the section of this road in Anne Arundel

County, have a large force grading at Friendship in the southern part of the county. The route is from Baltimore City to Drum Point Harbor, the southern limit of Calvert County, at the mouth of the Patuxent River. A lateral branch is also to be constructed to Washington, D. C. The distance from Baltimore to Drum Point is 82 miles; through Baltimore County 4 miles, Anne Arundel County 43½ miles and Calvert County 34½ miles. The distance from Baltimore to Washington, D. C., is 44 miles. The grading in Calvert County has been completed and a large amount of heavy work done in Anne Arundel County. The crossties are being delivered along the line of road, preparatory to track laying. This work has been completed as far as Obligation, 10 miles north of Friendship. The principal contractors are Rodgers & Clement, 45 Broadway, New York City. The work is not difficult; the maximum grade is 1.3 per cent. and the maximum curve is 9 degrees.

The company has renewed its application to the city council of Baltimore, asking it to order an election on the proposition to have the city vote $500,000 in bonds to aid the road, but the council has voted to indefinitely postpone consideration of the matter.

Belleville, Centralia & Eastern.—The tracklaying on this road, which is being built between Mt. Vernon and Belleville, Ill., 67 miles, by the Louisville, Evansville & St. Louis, has been completed to Baden, in Clinton County, 19 miles east of Belleville. All the grading has been completed with the exception of about half a mile near Richland Creek, near Belleville, where a bridge is being erected. It is stated that through trains will be running between East St. Louis and Evansville by June 15.

Birmingham & Jones Valley.—This company has been incorporated in Alabama. The proposed road is to extend from Birmingham through Avondale to St. Clair Springs, in St. Clair County. The capital stock is placed at $500,000.

Birmingham Mineral.—The Tuscaloosa Branch has been graded from Milldale to Bound Brook Mines, Ala., a point within 17 miles of Tuscaloosa. Tracklaying has been finished except on the last five miles to Bound Brook. This work will soon be resumed, and the extension opened to Bound Brook this month. It has not yet been decided whether to continue the line any further toward Tuscaloosa, but it is stated that if the latter town will vote the company a subsidy it will probably be completed to that point.

The track on the branch from Helena to Blocton, Ala., 10 miles, has been laid, and ballasting and surfacing are now in progress. The track between Gurnee and Blocton will be used jointly with the Brierfield, Blocton & Birmingham road. This company is building a bridge over the Cahaba River, and as soon as it is completed, probably by June 1, the Helena branch will be placed in operation.

Bristol, Elizabethton & North Carolina.—Carter County, Tenn., has voted a subsidy of $50,000 to this company, which is to build a road from Bristol to Elizabethton, Tenn. The town of Bristol previously voted $40,000 to aid the road.

Brunswick, Steinhachee & Gulf.—This company has been incorporated under the laws of Florida to construct a road from the Georgia State line to Deadman's Bay. P. A. McIntosh, W. S. Ivey, J. F. White, H. M. Wood and others are the incorporators.

Canadian Pacific.—The Dominion Government has asked Parliament to sanction the following grant of lands in Manitoba and the Territories to this company; 6,400 acres per mile for a branch from Glenboro westerly 60 miles, to a point on the branch running southeasterly from Brandon; and a similar grant for 100 miles from Brandon southwesterly to range 27, then easterly 25 miles to Deloraine.

Carolina Central.—A branch is proposed from Mt. Holly, near Charlotte, N. C., northward through the town of Statesville and Wilkes County to a point in southwestern Virginia.

Central of Georgia.—The extension of the Savannah & Western division from Eden west to Stirling, Ga., 57 miles, was completed last week. The last rail was laid near Lyons, Ga., where a connection was made with the Savannah, Americus & Montgomery over which trains will be run into Americus. From Americus the Central of Georgia has a line of its own to Birmingham, Ala.

Chattanooga Southern.—E C. Durand, of Oneida, Tenn., has been awarded the contract for building 15 miles of road in addition to the 20-mile section from Gadsden, Ala., north, which he was awarded some time ago. It is stated that nearly 1,000 men are engaged in the construction work between Chattanooga and Gadsden. The grading has been completed for 22 miles south of Chattanooga and about eight miles north of Gadsden. Passenger trains are running to Eagle Cliff, about 12 miles from Chattanooga. It is expected that the line will be completed to Pigeon Mountain, 13 miles further south, this month. A tunnel about 1,500 ft. long will be built through this mountain near Frick's Gap.

Chattanooga Western.—The Chattanooga Land, Coal, Iron & Railway Co., which controls this road, has decided to build an extension along the north side of the Cumberland River from a point near the Roane Iron Works to North Chattanooga, Tenn.

Chicago, St. Paul, Minneapolis & Omaha.—The company has filed a notice at Madison, Wis., of its intention to extend its line from Neillsville to Marshfield, Wis., a distance of 25 miles.

Columbus, Shawnee & Hocking.—About 600 men and 200 teams are reported engaged in the extension of this road between Saltillo and Sagers, O., 11 miles. A tunnel 450 ft. long is being built through sandstone, and is being completed at the rate of 10 ft. per day. Several short bridges will be necessary.

Colville & Puget Sound.—This company has surveyors in the field running a line from Colville, Stevens County, Wash., westward towards Puget Sound. It is stated that the Seattle & Montana and the Great Northern road are the real projectors of the road.

Dayton Coal, Iron & Railway Co.—The directors of the company propose to build a road from Dayton, Tenn., across the mountains to the Sequatchie Valley at Pikeville, Ky.

Delaware, Lackawanna & Western.—A dispatch says that the road has secured the right of way for an extension from a point near La Salle to Suspension Bridge, N. Y., along Niagara River to Niagara Falls, from Buffalo.

Duluth & Winnipeg.—The contracts for the extension of this road northwest from Grand Rapids, Mich., to Winnipeg, Man., have been let to Donald Grant & Co., of Fairibault, and Foley Bros. & Guthrie, of St. Paul, who built the line from Cloquet.

Fremont, Elkhorn & Missouri Valley.—The company has let the contract for the construction for two extensions in the Black Hills country in South Dakota. One is for a line between Whitewood, the present terminus of the Black Hills branch, and Deadwood. The other line is from Buffalo Gap to Hot Springs. On the latter it will be necessary to cut an 1,800-ft. tunnel through the mountains. Lusk & Streater, of Lusk, Wyo., have the contract to grade the line to Deadwood.

Great Northwest Central.—Construction work has been recently renewed on the road near Rapid City, Man., on the Manitoba & Northwestern, about 10 miles north of Brandon.

Greenville, Nashville & Chattanooga.—The city of Corinth, Miss., and Alcorn County, in which it is situated, have each voted this company a subsidy of $60,000, the company agreeing to begin construction work at Corinth.

Harriman Belt.—Grading has been begun for this belt road at Harriman, Tenn.

Hutchinson & Southern.—The extension of this road, which is being built from Kingman, Kan., south to the state line, 50 miles, is being constructed under the name of the Omaha, Hutchinson & Gulf by the Southwestern Construction Co., of which William E. Hutchinson, of Hutchinson, Kan., is President, and H. L. Jackson, of Kingman, is Chief Engineer. John S. Wolf & Co., of Kingman, have been awarded the contracts for grading, bridging and tracklaying and about 400 men and 200 teams are now at work on the extension. The grading has been practically all completed, and over 20 miles of track has been laid. The line passes through the towns of Kingman, Rego, Harper and Anthony to the state line. Congress has been asked to grant the company right of way through the Indian territory, and if this is done it is proposed to continue the line through the territory in the direction of the Gulf of Mexico. The road is being constructed through a prairie country with maximum grades of one per cent. and a maximum curvature of three degrees.

Joplin & Western.—The company has been incorporated in Missouri, with a capital stock of $300,000. The road is to be constructed from a point on the Kansas state line, in Cherokee county, to Joplin, and through the county of Newton to the state boundary line, a distance of 15 miles.

Kansas City, Chattanooga, Augusta & Charleston.—It is reported that a syndicate of English capitalists has agreed to subscribe for the bonds of this road, issued at $25,000 a mile, provided that the projectors secure right of way and terminal franchises. The road was formerly known as the Kansas City, Chattanooga & Port Royal.

Kentucky Roads.—Bills have passed the State Legislature incorporating the following roads: Central Kentucky & Ohio River; Barbourville Belt Line; West Point Belt Line; Kentucky & Cumberland, and the Interstate Tunnel Railway Co. Bills previously introduced to incorporate the following roads have become laws: Louisville & Hodgenville; Owensboro Belt Line; and the Danville, Lancaster & Pound Gap. The Frankfort, Carrollton & Madison; Central Valley; Owensboro, Falls of Rough & Green River; West Virginia, Pineville & Tennessee and the Louisville & Southeastern roads have had their charters amended by legislative enactment.

Knoxville, Cumberland Gap & Louisville.—Morristown, Tenn., has voted to subscribe the proposed subscription of $150,000 by Hamblen and Grangers counties and Morristown to the company for an extension of the road to Morristown, the contract for which has already been let to Allison, Shafer & Co.

Lehigh Valley.—The Lehigh Valley Railway, the Buffalo & Geneva, and the Geneva & Van Ettenville have been consolidated under the corporate name of the Lehigh Valley Railway Co. This consolidates the line now in operation between Buffalo and Lancaster; that under construction from Lancaster to Geneva, and the line from Geneva to Sayre, Pa., making a total mileage of 285 miles. A new Board of Directors was elected. E. P. Wilber, President of the Lehigh Valley Railroad, is President of the new company.

Louisville, Hardinsburg & Western.—The tracklaying between Irvington and Fordsville, Ky., 40 miles, has been completed to the town limit of Fordsville. A large trestle is being erected at this point, and is now nearly finished.

Macon & Atlantic.—Application has been made in the Georgia Superior Court at Macon for a charter for the Macon & Savannah Construction Co., the incorporators being A. Bocker, New York; Robert Ober, Baltimore; J. R. Young, Savannah; and R. H. Plant, W. W. Collins, J. Lane and W. B. Sparks, Macon, as stated last week. The company will have a capital stock of $1,000,000. The charter asked for is similar to the one granted the Macon Construction Co. A charter for the railroad company will also soon be applied for, the legal notice of this action having been given.

J. S. McTighe & Co., of Memphis, Tenn., and W. B. Strong, contractors on the Macon & Birmingham, Ala., have been awarded the contract for building the first 100 miles of the road. The survey is nearly finished on the section from Savannah to Soffkee, Ga.

Mexico.—The Mexican National Senate has passed the bill for funding the railroad subsidy indebtedness. Representatives of the subsidized roads are conferring with the Secretary of the Treasury, Dublan, and the government may be able to effect a settlement of the accruing subsidy indebtedness by the issuance of 50 year bonds.

Middle Georgia & Atlantic.—C. C. King & Bros., of Covington, Ga., have the contract for the grading and bridging on this road, from Covington to Machen, Ga.

Milwaukee Avenue Alley.—The charter of this company has been filed in Illinois. It is proposed to construct an elevated road in Chicago from Canal street, between Madison and Nulton streets, north between Fulton and Kinzie streets; thence northwesterly to Lawrence avenue. The capital stock is $5,000,000, and the incorporators are August Meyer, John M. Krause, Edward Weissert and Andrew C. Laushen, of Chicago; and Ferdinand Haussen, of Gray Landing.

Missouri Pacific.—The company is reported to have commenced work this week on a line from Joplin, in southwestern Missouri, through Galena and Baxter Springs, to Chetopa, Kan. From Galena to Baxter Springs the line will parallel the Kansas City, Fort Scott & Memphis. Other lines which it is stated the company may decide to build are: From Clinton, Mo., to Garnett, Kan.; from Bagnall, Mo., southwest through Hermitage and Collins to Nevada, shortening the line from St. Louis and Jefferson City to Fort Scott, and from Bagnall to Carthage, Mo., through Bolivar, Corry and Lockwood.

Mobile & Mississippi Shore.—The company has been incorporated in Alabama to build a road from Mobile northwest, through Port Gibson to a point on the Mississippi River. The capital stock is $50,000. The incorporators are: Hugh R. Crichon, George E. Sayre, J. G. Thomas, Louis Stearn, H. Austill, B. C. Willis, J. Pierce, all of Mobile, and A. J. Phillips, of Camden.

Morristown & Cumberland Gap.—Allison, Shafer & Co., of Chattanooga, have been formerly awarded the contract for this belt line at Morristown, Tenn., as anticipated some weeks ago.

Nashville, Chattanooga & St. Louis.—The location has been completed for the extension of the Jasper branch through the Sequachie Valley from Dunlap to Pikeville, Tenn., a distance of 21 miles. Contracts will soon be let and grading will begin June 1.

The company has secured an extension until May 20 of its option on the Tennessee & Coosa road. It is understood that if the company decides to purchase the line it will at once begin the construction of several branches and extensions.

Neville Island.—This company has been incorporated in Pennsylvania, with a capital stock of $100,000, to build a road about 14 miles long from a point on the Pittsburgh and Lake Erie near Chartiers to Neville Island, and along the southern side of the island to Coraopolis, on the northern end, where a bridge will be built to connect with the mainland. The tracks of the Pittsburgh and Lake Erie will be used to secure an entrance to Pittsburgh. The line will be used principally for passenger travel, but there will be some freight traffic in garden produce to the Pittsburgh market. The greater part of the grading on the island was done several years ago, and the piers of the bridge were erected, but the project was abandoned before it was completed. David Smith, of Tarentum, Pa., is President, and John Dallzell, and others, of Pittburgh, are directors.

New Roads.—A survey is being made from Bennettsville, northeast to Darlington, S. C., about 25 miles, by George Earle, of Darlington. The survey has been finished from Bennettsville to Hennegan's Landing, on Pee Dee River.

The Board of Trade, of Hastings, Neb., is having a survey made from Hastings, southeast to Superior, Neb., about 40 miles, for a branch road which the Atchison, Topeka & Santa Fe will be asked to build. The survey is being made by W. H. Fuller.

M. Howard, Morgan Smith and F. C. Faust have recently made a reconnoissance of a proposed line from Autaugaville to Booth's Station, Ala., eight miles.

Articles of incorporation have been filed in Montana, to build a road in Meagher County, from Townsend up Sixteen Mile Creek, and then with one branch extending to Castle and the other to White Sulphur Springs. The aid of the Northern Pacific in the enterprise has been asked.

New York, Fort Wayne & Chicago.—It is stated that this road, which has been incorporated to build across northern Ohio, has purchased all the claims against the American Midland, and that it will purchase that road when it is sold at Toledo, June 2. It is the intention to then complete the road from Glandorf, O., to Fort Wayne, Ind., much of this being graded. John Lee, of Crawfordsville, Ind., is President, and he has interested ex-Gov. J. B. Foraker and other prominent Ohio men in the scheme.

Northern Pacific.—Donald, Smith & Howe, of North Yakima, Wash., have been awarded the contract for building the proposed branch to Lewiston, Idaho. The new line will start from Pullman, on the Spokane & Palouse branch, thence through Moscow to the head of Bear Creek, Pot Latch and Clearwater to Lewiston. The length of the line will be about 72 miles. The contract calls for the completion of the road by Dec. 1. The rails and ties have already been ordered.

Northern Pacific & Manitoba.—The tracklaying on the Morris and Brandon extension has been completed to Brandon, Man., but the company has much difficulty to secure the right of way into the town.

Ohio Valley.—The following is a corrected list of the contracts awarded on the 16 miles of road between Bellaire and Powhattan, O.: Sections 1 to 3 are completed; sections 4, 5, 6, 7, 8, 9, 12 and 13 have been awarded to J. T. Gibney, of Indianapolis; section 11 to J. K. Miller, of Steubenville, O.; sections 10 and 16 to J. T. Hart, of Marietta, O., and sections 14 and 15 to William Duncan, of Pittsburgh. The maximum grades on the line are ½ per cent. and the maximum curves about four degrees. There will be a one span iron bridge. The road will be operated by the Pennsylvania Company. A. J. Warner, of Marietta, is President and M. J. Becker, of Pittsburgh, is Chief Engineer.

Pacific Short Line.—The Wyoming Pacific Improvement Co., of New York, last week let the contract for building this road from O'Neill, Neb., to Ogden, Utah, about 830 miles, to Scullen & Steacy, of St. Louis, Mo. The company is to furnish rails, ties, etc. The work is to be sublet in sections of 50 miles, and some of these contracts have already been awarded. The contract price is said to have been $8,000,000, and that Scullen & Steacy will advance $3,000,000 for the work and receive the bonds of the road in payment. The contractors will probably start the work from three different points; from O'Neill west to Hemingford, Neb., where the line will make a junction with the Burlington & Missouri River road; west from Hemingford to Casper, Wyo., the terminus of the Fremont, Elkhorn & Missouri Valley, and at Ogden, working east. The survey has been completed from Ogden to within 75 miles of the Nebraska line, and the line is ready for grading. The Manhattan Trust Co. is the financial agent in New York City.

Philadelphia & Sea Shore.—The grading has been completed on the southern end of the line in Cape May County, N. J., with the exception of a few miles at Petersburg and the section from Rio Grande to Cape May Court House. Grading is now in progress on these sections. The right of way through the lower part of the county has been secured with much difficulty and the company has had to pay large amounts for the land it needed.

A survey is being made for a proposed branch of the

main line east to Weymouth, and thence south to May's Landing, about 10 miles.

Fox & Loper and J. E. Teno, contractors, have brought suit against the company in the Camden County Court for $25,000 damages for alleged violation of contracts.

Pittsburgh, Akron & Western.—It is stated that the engineers have decided upon the northern route for the line between Akron and Plymouth, O., near Chicago Junction. The survey west of Akron will pass through Copley, Sharon, Medina, Spencer and New London.

Rhinelander & Western.—The company has been organized to construct a line from Rhinelander, Wis., westward 15 miles to a connection with the Chicago, Milwaukee & St. Paul. E. S. Shepard, Charles Chaffie, G. S. Cook, E. O. Brown and John Barnes are the incorporators. The capital stock is $200,000.

Rio Grande Southern.—About 700 men are now grading this road from Dallas, on the Denver & Rio Grande, south toward Telluride, Colo., and from Durango north. The distance is 45 miles. The force at work will soon be increased to 1,500. The grading has been completed from Dallas for about eight miles and is in progress south toward Telluride and Rico. It is expected to have the line completed to the former point in August and to Rico in October. The location from Durango, the southern terminus, has been completed for a distance of 15 miles.

Rockport, Langdon & Northern.—The grading was begun on this road at Rockport, Mo., May 2, by C. D. Haines, the contractor. The work will probably be completed in six weeks.

St. Louis, Kennett & Southern.—Construction work has been commenced on this road at Campbell, Dunklin County, in southeastern Missouri, and on the St. Louis, Iron Mountain & Southern.

Savannah, Americus & Montgomery.—The work of changing the gauge of the road to standard has been practically finished, except on the western end, where work is in progress on the 19 miles between Richland and Louvale, Ga.

The city council of Montgomery, Ala., has granted the company right of way over certain streets in the city, and station grounds are said to have been purchased. It is also stated that contracts have been let for part of the extension between the Chattahoochee River and Montgomery. King & Hannon, of Montgomery, have the contract for the grading on one section of this extension.

Sherman, Denison & Dallas.—The survey has been nearly completed for the first section of this road from Sherman to Denison, Tex., about 10 miles. It is proposed to continue the line to Dallas, about 50 miles further south. The road is to be an extension of the Missouri, Kansas & Texas, and the survey is in charge of George M. Jarvis, Resident Engineer of that road at Denison. As soon as the location has been completed the contract will be let for the first 10 miles from Sherman.

South Bound.—George D. Wadley, Chief Engineer of the Savannah Construction Co., has commenced the survey of the route of the South Bound road from Savannah to the proposed crossing of the Savannah River, near Sisters' Ferry.

South Florida.—Two surveys have been made for the proposed branch from Pemberton Ferry north to Floral City, Fla., 15 miles. One enters the latter town by way of Cove Bend and the other along the south side of Lake Consuelo. A survey is now being made from Floral City north to Tompkinsville.

Spokane Falls & Northern.—The grading is in progress on the extension from Marcus north along the Columbia River to Little Dalles, Wash., 27 miles, about 600 men being engaged in the work. The line will probably be put in operation in July. Trains are now running to Marcus, 100 miles north of Spokane Falls.

It was the intention to extend the road from Little Dalles to the mining country of Kootenai Lake, or to the town of Nelson, B. C., this season, but the Dominion Parliament refused to grant the company a charter to cross the International boundary line, and it has not yet been determined whether it will build any additional road this season other than the line to Little Dalles, from which point there is uninterrupted navigation on the Columbia River as far as Revelstoke, B. C., on the Canadian Pacific. The road will probably be extended soon to the Metaline mining region on the Pend d'Oreille River east of Little Dalles. The company also obtained from Congress at its present session a right of way through the Colville Indian Reservation, and it will cross the Columbia River at Marcus next season, and extend westwardly to the Okanogan River, and the region of the Okanogan and Rock Creek mines near the international boundary line, having in view a western terminus on Puget Sound or Vancouver, B. C. D. C. Corbin, of Spokane Falls, Wash., is President.

Tacoma & Lake City.—The right of way for the Olympia extension of this line is being cut at three points between Lake City and the Nisqually River and a fourth is working between the river and Olympia. The officers deny the recent report that the Union Pacific has secured control of the road.

Tacoma, Olympia & Gray's Harbor.—The company has filed articles of incorporation in Washington. The incorporators are: N. H. Owings, W. H. Calkins, H. S. Huson and James S. Ashton. The capital stock is $5,000,000. The company is to build branch lines to the Northern Pacific system in western Washington.

Talbot, Queen Anne's & Kent.—A reconnoissance of this road is being made by Charles Goldsborough, of Baltimore. The road is to extend from Trappe, in Talbot county, to Chestertown, Kent County, and also from Trappe to the Choptank River, at a point opposite Cambridge. The route is through the towns of Easton, Longwood, Skipton, Wye Mills, Centreville and Church Hill. Among the directors are Gen. E. L. F. Hardcastle, George R. Goldsborough, Hedge Thompson, Gen. William McKenney, John B. Brown and James Alfred Pearce.

Talbotton & Western.—The surveys for this road have been completed from Talbotton, Ga., east to the Flint River, a distance of 18 miles, passing through Centerville, Prattsburg and Carsonville. The surveys have been completed from Talbotton west to a connection with the Georgia Midland & Gulf at Waverly Hall, a distance of 12 miles. Another line is being run from Talbotton to Ellerslie, a distance of 16 miles, and this will soon be completed. John L. Cowan is Chief Engineer and John Parker, of Prattsburgh and W. A. Little, of Columbus, are directors.

Tallapoosa, Chattanooga & Illinois.—A party of engineers are making a survey through Floyd County, Ga., for a road of this name. The survey passes near the city of Rome and crosses the Rome & Decatur and the Chattanooga, Rome & Columbus about 12 miles west of Rome.

Toledo & Michigan Belt.—Bick & Glenn, the contractors for building this belt road at Toledo, O., have a force of men at work at Manhattan Junction, and it is stated that the construction work will be continued from that point until the road has been completed.

Toledo & Ohio Northern.—This company and the Indiana Northern were organized last week by the Lake Shore & Michigan Southern to build a road from Fayette, the terminus of the Fayette branch, Fulton County, O., to Chesterton, Ind., near Chicago. The distance is about 150 miles. In an interview President Newell stated that there was a broad strip of country in Northeastern Ohio and Northern Indiana, between the main line and air line divisions of the Lake Shore road which was without East and West railroad facilities, which he thought should be occupied. In 1881 a company was organized to construct the line from Fayette, O., through Angola, La Grange and other towns to the main line near Chesterton, Ind. The organization was completed in 1882, but the New York, Chicago & St. Louis was then started, and the Lake Shore was hardly in a condition to make extensions. The company is now in a position to resume the undertaking which was abandoned for financial reasons seven or eight years ago. "In the meantime, however," continued Mr. Newell, "some people who had been building roads in Michigan through local aid, for the purpose of selling these roads, came down into Indiana and Ohio, and began the same operations there. They secured from townships in Steuben and La Grange counties, Ind., a vote authorizing the levy of a tax of two per cent. for a line over the route which had been surveyed by our company in 1881, and they now claim that they are ready to build this road. That is about the situation at present. There is not traffic for two roads through that territory. We have just revived our old Ohio charter by the election of new directors. Our Indiana charter has lapsed, but a new company has been organized. To a delegation from Fayette and other towns on the proposed line the road in Ohio, I have stated that our line will be built if the towns in Ohio and Indiana extend to us the necessary aid."

Toledo & Western.—The preliminary survey of the Indiana division, incorporated as the Indiana Northern, was commenced last week at Angola, Steuben County, near the state line. It is to be continued westward through Fayette to Elkhart, following the graded roadbed of the abandoned Canada Southern.

Topeka, Westmoreland & Marysville.—The locating survey was completed this week for the section between Topeka and Westmoreland, Kan. The route from Westmoreland to Maysville has not yet been decided.

Utah Northern.—A 20-mile section of this road in the Cache Valley, Utah, is being built by contractor Jessup, from the upper end of Bear River Cañon, north toward Oxford. There is much rockwork in the cañon, but this is progressing satisfactorily.

Western of Alabama.—It is stated that this company intends to soon begin the construction of a line about 14 miles long, from Selma to Marion Junction, Ala., between which points the tracks of the East Tennessee, Virginia & Georgia are now used.

Wichita Valley.—The grading is now finished for a distance of 30 miles from Wichita Falls toward Seymour, Tex. The tracklaying has been completed on the first 15 miles southwest of Wichita Falls. It is stated that when the line has been completed to Seymour grading will be commenced on an extension from Wichita Falls north to El Reno, in the Indian Territory, to which point the Chicago, Rock Island & Pacific has been built.

Wrightsville & Tennille.—The directors have filed in Georgia the location of the proposed extension southwest through Laurens, Dodge and Wilcox counties to Abbeville, a distance of 45 miles.

Yakima & North Pacific.—Officers of the Northern Pacific have incorporated this road to extend from North Yakima westerly along the Natchez River, across the Cascade Mountains near Coulitz pass, thence down the Coulitz River through Lewis County to Chehalis, and Leadwater along the Wellappa River to Shoal Water Bay, near South Bend, with a branch from South Bend, northwesterly through the counties of Pacific and Chehalis to a point on the south side of Gray's Harbor; also a branch through Pacific County to the Columbia River, opposite Astoria; thence from Astoria westerly down the Columbia River to the Pacific Ocean, and thence north, through Pacific County and along Spit Bowen Shoal Water Bay and the ocean to Leadwater Point. The capital stock is $5.000,000.

GENERAL RAILROAD NEWS.

Bangor & Piscataquis.—A petition has been signed by many of the prominent men of Bangor, Me., asking for the appointment of a commission to negotiate the sale of this road. The city of Bangor owns nearly the entire issue of stock, and several propositions have heretofore been made for the sale of the stock it holds, but the negotiations have never been carried through. The Maine Central several years ago agreed to buy the road, but its proposition was not accepted. The Castine & Bangor has also offered to buy the line, and make it part of its proposed system, but it would not agree to the price for the stock, asked by the city. Last year the Maine Central built an extension of the Dexter & Piscataquis, from Dexter to Dover, Me., on the Bangor & Piscataquis, and this branch has taken a large traffic from the latter road and made its operation unprofitable.

Boston & Maine.—At a special meeting of the stockholders of the Boston & Maine, held in Lawrence, Mass., May 8, to consider the proposed purchase of the Eastern and Portsmouth, Great Falls & Conway roads, on terms and conditions previously agreed upon, 39,661 shares voted in favor of the proposition and 91 against it. At special meeting of the Eastern road in Boston on the same day, to consider the consolidation with the Boston & Maine, the proposition was accepted by a vote of 59,671 shares in favor to 4,768 opposed. The stockholders of the Portsmouth, Great Falls & Conway have also ratified the agreement.

Canadian Pacific.—The annual report for the year to Dec. 31, 1889, gives the following figures: Gross earnings, $15,030,600; operating expenses, $9,024,601; net earnings, $6,006,059; fixed charges, $3,779,132; surplus, $2,226,926; surplus after payment of supplementary dividend, $1,570,026; surplus from previous year, $326,423; making total surplus carried forward, $1,903,350; increase in gross earnings over previous year, $1,835,115; decrease in working expenses, $300,359; increase in profits, $2,230,285. The report attributes the decrease in operating expenses to the large expenditures made for improvements during the last few years, and say it is the intention of the directors to continue the improvements, and expresses the belief that the proportion of working expenses to gross earnings will soon be brought below 55 per cent. The directors express their intention to continue the dividends at the rate of five per cent., and their belief that there will be no difficulty in maintaining this rate. The shareholders authorized the directors to proceed with the construction or acquisition of several short local lines. The land sales for the year were 195,160 acres for $731,190, as against 102,310 acres for $553,910 in 1888.

Carolina Central.—A meeting of stockholders is to be held in New York, May 21, to vote on the proposed issue of preferred stock to the amount of $1,950,000, to take up the present second and third mortgage six per cent. income bonds of this company, which amount to $1,200,000 and $1,500,000 respectively.

Chicago, St. Louis & Pittsburgh.—The seventh annual report of the road has been issued. The gross earnings were $5,950,070, an increase of $578,424; expenses, $4,705,604, an increase of $226,918, and net earnings, $1,244,465. The profits above charges of all kinds were $106,022, against a loss of $216,384 the previous year. A special meeting of stockholders will soon be called to submit an agreement of consolidation with other western lines by the Pennsylvania Co.

Cleveland, St. Louis & Kansas City.—The road was sold to judgment creditors in St. Charles County, Mo., this week. J. H. Bethune, representing the lienholders, was the purchaser, paying $142,700. The road was sold under an execution issued in March in favor of Shafer & Bethune, Crane Bros. & Co. and Bethune, Shafer & Co., for labor and material furnished. The sale was delayed on account of a petition for the appointment of a receiver, which was denied.

Delaware, Lackawanna & Western.—The company proposes to reimburse itself for advances to its leased line, the New York, Lackawanna & Western, by the issue to itself of $5,000,000 four per cent. bonds, secured by a mortgage on the leased line. The lessee has expended nearly the amount of the mortgage on terminal facilities at Buffalo and other improvements which has thus far stood on its books as a debit balance against its leased line. The new mortgage is intended to adjust accounts between the two companies.

East Tennessee, Virginia & Georgia.—The control of the Cincinnati, Selma & Mobile has been acquired by this company, and the property has been formally transferred and possession taken. The jurisdiction of the superintendent of the Alabama Division and other general officers has been extended over the Cincinnati, Selma & Mobile. The latter line extends from Elizabeth to Akron, Ala., 61 miles, and it has a trackage agreement with the East Tennessee, Virginia & Georgia to run trains to Marion Junction to Selma, 14 miles.

Gainesville & Dahlonega.—A decree has been granted for the sale of this road for the benefit of the creditors. The property consists of 15 miles of graded road, right of way and franchises from Gainesville to Dahlonega, Ga., 26 miles, four miles of track near Gainesville and a bridge spanning the Chattahoochee River. W. A. Charters, Receiver, will sell the road in Gainesville, July 8.

Jacksonville Southeastern.—The road was sold by the master in chancery at Salem Ill., May 10, by virtue of a decree recently obtained in the Marion County Circuit Court. The amount paid was $500,000, the purchasers being representatives of the bondholders chosen in pursuance of the plan of reorganization. The road will continue to be owned and operated in the same interest as hitherto.

Knox & Lincoln.—At the elections held in the towns which hold stock of this Maine road, to decide whether to accept the recent proposition of a Boston syndicate to buy and operate the road, a majority of the towns voted in favor of it, but those towns which hold the majority of the stock have voted not to sell. It is stated that it has been found that it would require a unanimous vote of all the towns interested before the road could be sold. A new plan has been proposed, which it is believed will be accepted. This is to lease the road for a long period. This would only require a majority vote.

Maine Central.—The Upper Coos and Hereford roads have been leased by the Maine Central, and will hereafter be operated by the latter corporation as part of its system, and the authority of the general officers of the Maine Central will extend over the leased line.

Memphis & Charleston.—A stockholders' meeting will be held in Memphis on July 9 for the purpose of considering the advisability of acquiring, by purchase or otherwise, certain railroads of building branches and of guarantee bonds of other railroads.

Merchants' Terminal Association.—This company, which is building yards and tracks, some of them elevated, in St. Louis, in connection with the new Merchants' Bridge across the Mississippi, expects to have its elevated structure finished by June 15. The officers assert that all connecting railroads will be treated exactly alike as to accommodations and rates. They say that delays both to city traffic, and to through freight between the East and the West, have been numerous and annoying on the St. Louis bridge, and they hope therefore to secure traffic from the older as well as the newer roads. They claim that considerable freight now goes via Quincy or Louisiana which will naturally go through St. Louis when the transfer facilities are enlarged. The amount of bridge bonds outstanding is $1,500,000. The bonds and stock are nearly all held by twenty-five St. Louis capitalists.

Michigan Central.—The annual report for the year 1889 gives the following figures: Gross earnings: Freight, $8,736,962, a decrease of $146,483; passenger, $4,327.091, an increase of $138,109; mails, $249,816, an increase of $20,780; express, $368,334, a decrease of $14,286; miscellaneous, $104,720, an increase of $18,283. Total earnings, $13,786,925, an increase of $16,403. The expenses were: Operating expenses and taxes, $9,895,158, a decrease of $191,447; net earnings, $3,891,767, an increase of $207,850; interest and rentals, $2,512,526, a decrease of $8,565; proportion paid to Canada Southern, $407,444, an increase of $68,283. Total net income, $1,010,730, an increase of $147,727; paid five per sent. dividends, $936,010, an increase in dividend of one per cent.; surplus,

$73,820, a decrease of $39,655. The funded debt was reduced $60,000. Operating expenses included $114,000 for new locomotives, $245,000 for new cars and $105,000 for new iron bridges.

Missouri Pacific.—The directors have decided to issue $7,000,000 of new five per cent. bonds, and use the proceeds to pay off the floating debt and leave about $2,000,000 for new construction and equipment. A special meeting of stockholders will be held on July 15, to obtain the necessary authority for the issue of the bonds and for the increase of capital stock. The largest stockholders of the company have already signified their intention to subscribe for their full proportion of the new securities, which guarantees the success of the plan.

The following is a synopsis of the circular issued to explain the plan: To pay the debt incurred by the construction of lines in Missouri, Kansas and Nebraska, and to pay for construction, now under way, and for additional equipment acquired, no part of which construction and equipment has been provided for by the issue of any stock or securities of the company, it is proposed to deposit with a trust company the first mortgage bonds of auxiliary companies held in the treasury, amounting to $10,250,000, and also first mortgage bonds of auxiliary companies which shall be hereafter acquired from construction now contemplated and in progress, and to issue $7,000,000 (out of an issue of $10,000,000 to be authorized) first collateral mortgage bonds, bearing five per cent. interest, and running 30 years; these bonds to be issued at a rate not exceeding 80 per cent. of par value of the deposited and underlying first mortgage bonds of auxiliary companies. The laws of Missouri require that the bonded indebtedness shall not exceed the capital stock, so that it is proposed to increase the latter by $7,000,000, but to issue only $700,000 of such increased stock in connection with the present issue. Stockholders of record on May 13, 1890, will have the right to subscribe for the $7,000,000 first collateral mortgage bonds and $700,000 stock at the rate of $950 for each bond and one share of stock, each stockholder to be entitled to subscribe to the bonds and new stock to an amount equal to 15 per cent. of his holding of present stock. The new stock, except such amount as shall be subscribed for with the bonds and such additional stock as shall be required to carry out exchanges already made for the stock of the St. Louis, Iron Mountain & Southern, not to exceed for both those purposes $3,000,000, shall only be issued for such purposes as stockholdeas may, at regular or special meetings, determine, and shall not in the meantime be issued or used.

New York Central & Hudson River.—The earnings of the road for the quarter and half year to March 31 were as below:

Three months to March 31.

	1890.	1889.	Inc. or dec.
Gross Earnings	$8,573,780	$8,033,478	I. $540,302
Oper. exp	5,718,159	5,501,108	I. 217,051
Net earn	2,855,621	2,532,370	I. 323,251
Fixed charges	1,965,420	1,963,260	I. 2,160
Profit	890,201	569,110	I. 321,091
Dividend 1 per cent	894,283	894,283	
Deficiency	4,082	325,173	D. 321,091

Six months to March 31.

	1890.	1889.	Inc.
Gross Earnings	$18,105,032	$17,204,368	$900,664
Oper. Expen	11,937,507	11,472,748	464,759
Net Earnings	6,167,525	5,731,620	435,905
Fixed Charges	3,930,840	3,926,520	4,320
Profit	2,236,685	1,805,100	431,586
Dividend	1,788,566	1,788,566	
Surplus	448,119	16,534	431,585

New York & New England.—The report to the Massachusetts Railroad Commissioners for the quarter ending March 31 shows:

	1890	1889.	Inc. or dec.
Gross earnings	$1,285,678	$1,221,091	I. $64,587
Oper. expenses	883,889	870,402	I. 13,487
Net earnings	$401,789	$350,689	I. $51,100
Other income	1,403	931	I. 472
Total income	$403,192	$351,620	I. $51,572
Charges	418,872	406,528	I. 12,344
Deficit	$15,680	$54,908	D. $39,288

Northern Pacific.—A dispatch quotes N. C. Thrall, assistant to President T. F. Oakes, as saying: "Mr. Villard and his associates, some months since, formed the Chicago & Northern Pacific, the purpose of which was to acquire terminal facilities in Chicago for the Northern Pacific. My understanding is that the Chicago & Northern Pacific has purchased the Chicago & Great Western and lea ed it to the Wisconsin Central, and that the latter company then leased all its property to the Northern Pacific. This transaction was completed some time ago. As to the rumor concerning the Chicago & Calumet Terminal Co., the statement that Mr. Villard made an offer for it, I believe is correct, but I am not aware that the deal has been closed."

Ohio Central.—In the General Term of the Supreme Court, at New York City, a decision has been made in the suit brought by David H. Gould against George I. Seney and others. The action resulted from the scheme to unite the Ohio Central, the Atlantic & Northwestern and the Richmond & Alleghany roads, so as to make a through line from Richmond, Va., to Toledo, Ohio. At the time this arrangement was made the Ohio Central had a line from Toledo to Canton, the Atlantic & Northwestern possessed a charter to build between Point Pleasant on the Ohio River and the Falls of the Kanawha, while the Richmond & Alleghany ran from Richmond to Clifton Forge. In 1881, it was decided to raise $5,000,000 from the stockholders of the three roads. The money thus obtained was placed in the hands of Mr. Seney and Samuel Shethar, as a committee. To complete the road $500,000 was to be advanced to the Ohio Central, $1,250,000 to Richmond & Alleghany and the residue to the Atlantic & Northwestern. The through line was never completed, as the Richmond & Alleghany was unable to have a bill passed by the Virginia Legislature permitting it to extend its road. The General Term holds that the Ohio Central and the Metropolitan Bank of New York City cannot be held responsible for their share in the transaction, but that the two trustees must account for the $1 250,000 they gave to the Richmond & Alleghany, which did not carry out its contract, and for the $148,066 which they paid on coupons of the Ohio Central, which had been advanced $500,000; in addition, $1,200,000 was ex pended on actual construction. The funds paid over to the Richmond & Alleghany were secured by $2,000,000 of the company's second mortgage bonds as collateral. These bonds came into the possession of the Metropolitan Bank.

Philadelphia & Reading.—Spencer Ervin, a stockholder of the company, last week at Philadelphia filed a bill in equity against the Pennsylvania, Aldace F. Walker, the Philadelphia & Reading, its President, Managers and Voting Trustees. The Court is asked to decree as illegal agreements entered into in June, 1887, referring to harmonious conduct of business by the Pennsylvania and Philadelphia & Reading roads, though Mr. Ervin claims "their sole object was to effect an agreement by means of which competition between said companies in the business of transporting coal and merchandise on the Philadelphia & Reading Railroad and the Schuykill Valley road should be prevented." This arrangement, he alleges, amounted to an agreement of pool freights.

St. Louis, Keokuk & Northwestern.—A mortgage for $8,000,000 has been filed for record by this company in several counties in Missouri. It is given in favor of the Chicago, Burlington & Quincy, and part of the funds secured by the issue of the bonds are to be used for erecting a bridge across the Missouri River below St. Cloud, Mo., extending the line into St. Louis and providing terminal facilities in that city.

St. Louis & San Francisco.—The annual report shows that the company now operates 1,329 miles of road in Missouri, Kansas, Arkansas, Texas and the Indian Territory. The gross earnings were $6,052,950.68; operating and general expenses, $3,264,683.18; net earnings, $2,788,267.50; taxes, $655,534.57; improvements, $30,462.75; total expenditures, including taxes and improvements, $3,460,680.50; leaving net revenue from traffic $2,592,270.18, against $2,109,440.25 last year. There had been an increase of 1.06 per cent. in the average number of miles operated; the total operating expenses showed a decrease of 2.70 per cent.; the gross earnings increased 4.84 per cent. and the net earnings 15.33 per cent. The cost of service per train mile decreased 3.23 per cent., and per road mile 3.73 per cent.; the earnings per train mile increased 4.27 per cent. and per road mile 3.74 per cent., as compared with the previous year. No construction of new branches or extensions has been undertaken during the year. To settle its debt to the road, the Atlantic & Pacific has recently transferred to the former 1,103,038 acres of land in Arizona and New Mexico at the rate of 75 cents an acre, or at a valuation of $827,278.50 for the whole.

Sturgis, Goshen & St. Louis.—This road, formerly known as the Canada & St. Louis, is now controlled by the Lake Shore & Michigan Southern, and will be hereafter operated by that road between Goshen, Ind., and Sturgis, Mich., 28 miles. The Battle Creek & Sturgis, extending from Battle Creek to Sturgis, 42 miles, and formerly known as the Bay City & Battle Creek, is understood to have been purchased by the Michigan Central.

Texas Mexican.—A meeting of stockholders will be held at Laredo, Tex., June 25, to authorize the issue of $2,430,000 of first mortgage bonds, and $1,444,000 of income bonds, the funds thus obtained to be used in changing the road to standard gauge, and to cancel the present bonds.

Upper Coos.—The Upper Coos and Hereford roads having leased their roads, franchises and property to the Maine Central, the latter corporation has taken possession and will hereafter operate both roads.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, May 14, 1890.

The two meetings which were in session all of last week considering the question of the restoration of freight and passenger rates, and which gave hopeful indications of reaching at least a temporary agreement, were complete failures, and it is not likely that any further attempt will be made this week to restore rates. The sub-committee which was considering the freight situation were unable to arrive at any understanding in regard to what territory should be subject to the proposed division of traffic, and adjourned, reporting to the general committee that they were unable to perform the work assigned them. The passenger men had arrived at a point where all the lines had voted to restore rates (except the Wisconsin Central, which still adhered to its demand for either a differential or slower time on the part of its competitors), when the Chicago, Milwaukee & St. Paul announced that it would not agree to restore rates unless the Wisconsin Central came into the agreement. Consequently nothing but an adjournment was possible, which was taken as soon as this was known.

Immediately upon the failure of the Passenger Agents to form an association, the Chicago & Alton gave the required notice that it would on May 13 put in effect a rate of $3 each way between Chicago and Kansas City, giving as the reason for so doing that the present rates of $8 and $5 were not being maintained. This has been followed by similar announcements from other roads, so that now the prevailing rates are as below, though by the time this reaches your readers the figures may be out of date:

Chicago and Kansas City, Omaha or St. Paul, $3; St. Louis and Kansas City, 50 cents; Cincinnati to Kansas City via O. & M., $4; Kansas City and St. Paul, $6.

The east-bound lake and rail rates are becoming demoralized. On May 9 the rates from Chicago to New York were reduced on 5th class from 25 to 20 cents, and on 6th class from 20 to 17½ cents. To Baltimore the 6th class rate was made 14½ cents and to New England points 24½. The reduced rates are 10 cents on 5th and 7½ on 6th class below the all-rail rates. In connection with these cuts it is reported that the lake and rail lines will pay all switching charges from the Union Stock Yards to the docks.

The reduction in the rate on oats to 22 cents, Chicago to New York, effective May 12, applies over the following lines: Baltimore & Ohio, Chicago & Grand Trunk, Chicago, St. Louis & Pittsburgh, Michigan Central, Pittsburgh, Fort Wayne & Chicago, Chicago & Atlantic, Cleveland, Cincinnati, Chicago & St. Louis, Lake Shore & Michigan Southern, New York, Chicago & St. Louis and Wabash, but does not apply on traffic destined to points in Kentucky, Virginia and the Carolinas.

The various Associations are holding their regular monthly meetings this week. Among the subjects under consideration are: rates from Chicago to the "Soo" district; packing house products, Sioux City to Texas points; establishment of through billing arrangements with the Great Northern line; revision of general rules and regulations affecting state and interstate traffic; rates on live stock transported in palace stock cars; stopping of cattle from points west of Missouri river in transit to fatten.

The Central Traffic Association also has a number of important questions before it for consideration. The most important is the question of the merging of the Ohio River Traffic Association with the Central Association. At the rates now quoted by the lake and rail lines it is practically impossible for the all-rail lines to get any of the through business, but it is difficult to see just how they can alter the situation at present.

Traffic Notes.

Special Agent Kretschmer, of the Interstate Commerce Commission, was in the city this week.

A meeting of the Universal Classification Committee has been called by Chairman Midgley, to be held in Buffalo May 21, for the purpose of completing the details of a uniform classification.

The Atchison, Topeka & Santa Fé has put on a through vestibuled train between Chicago and Denver. The time is about 35 hours. The same road announces that it will soon shorten the time of through passenger trains between Chicago and Los Angeles 24 hours.

The William Deering Company, of Chicago, recently shipped two train loads, 51 cars, of agricultural implements, over the Atchison, Topeka & Santa Fe, to Kansas City and points beyond. A special car, with gay decorations and carrying a band of music, was sent along with the foremost train.

The Cleveland Car Service Association handled during April 28,994 cars, of which 74 per cent. were released within 48 hours. The time in all cases is computed from the hour of arrival, and the average detention of all cars, including coal and coke, on which 96 hours' free time is allowed, was 1.58 days.

A case was filed in the Federal Court at St. Louis on Tuesday by the Nelson Distilling Co. against H. Morsman, agent of the Pacific Express Co., under the Interstate commerce law, for refusing to carry the goods of of the Nelson Distilling Co. The plaintiff says that Morsman instructed all drivers to pay no attention to the calls of the distilling company. The Federal Grand Jury returned an indictment against Morsman, and he gave bail.

The Iowa Railroad Commissioners, on the complaint of the Dubuque Baseball Club, that its members were refused seats in a chair-car on the Burlington, Cedar Rapids & Northern, have held that the company has the right to reserve chair-cars for through passengers so long as it furnishes first-class cars for other passengers, and it was no discrimination to refuse to allow the baseball club to occupy a chair-car for local journeys.

The *Northwestern Lumberman*, in discussing the low rates now in force on lumber (white pine), from Chicago to the Missouri River and the correspondingly low rates (on yellow pine), from Texas and Southern points to Kansas and Nebraska, which was announced immediately after the reduction by the Chicago roads, finds it impossible to decide what effect, if any, will be produced on the lumber markets. The demand from consumers is at present light and there are various uses to which the respective kinds of lumber are adapted which are not easily changed by a slight difference in the price. The dealers in white pine indulge in the hope that the Southern roads are losing much more money at their present rates on hard pine than are the Chicago roads on the rates at which they carry white pine, and that, therefore, the rates from the South will before long have to be raised.

On and after June 1 the Buffalo Car Service Association will be known as the Western New York Car Service Association. Manager Van Etten has given notice to consignees and consignors of freight in Attica, Batavia, Bradford, Canandaigua, Charlotte, Cuba, Dunkirk, Dansville, Hornellsville, Le Roy, Lockport, Mt. Morris, Niagara Falls, Rochester, Salamanca, Suspension Bridge, Tonawanda, and Warsaw, that the rules will go into effect at those places June 2. The circular is signed by the Bradford, Bordell & Kinzua, Buffalo Creek, Buffalo, Rochester & Pittsburgh, Delaware, Lackawanna & Western, Grand Trunk, Lake Shore & Michigan Southern, Lehigh Valley, Michigan Central, New York Central & Hudson River, New York, Chicago & St. Louis, New York, Lake Erie & Western, Northern Central, Western New York & Pennsylvania, and the West Shore.

The Interstate Commerce Commission.

The commission has decided the complaint of J. B. Pankey against the Richmond & Danville and others, involving alleged overcharge on freight, denying complaint of complainant, but deciding that the International & Great Northern should refund to complainant amount of overcharge caused by failure of its agent at Troupe, Tex., to waybill the freight by the route directed by the complainant. Also the cause of Charles Alvey, against the Illinois Central, denying claim of complainant for alleged unjust charge in shipment of freight, and ordering the company to cease and desist from longer operating its special immigrant freight tariff, on the ground that it is in violation of the act to regulate commerce. Opinion in each case by Commissioner Bragg.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, May 10, amounted to 68,171 tons, against 80,108 tons during the preceding week, a decrease of 11,937 tons, and against 41,935 tons during the corresponding week of 1889, an increase of 26,236 tons. The proportions carried by each road were:

	W'k to May 10.		W'k to May 3.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	5,700	8.4	8,431	11.6
Wabash	2,587	3.8	3,921	5.4
Lake Shore & Michigan South.	11,648	17.1	13,162	18.1
Pitts., Ft. Wayne & Chicago	5,762	8.4	7,027	9.7
Chicago, St. Louis & Pitts.	8,748	12.8	7,488	10.3
Baltimore & Ohio	6,623	9.7	4,112	5.7
Chicago & Grand Trunk	8,343	12 2	8,822	12.2
New York, Chic. & St. Louis	11,226	16.5	7,921	10 9
Chicago & Atlantic	7,534	11.1	11,719	16.1
Total	68,171	100.0	72,633	100 0

Of the above shipments 2,838 tons were flour, 35,266 tons grain, 2,820 tons millstuffs, 4,486 tons cured meats, 1,208 tons lard, 8,820 tons dressed beef, 839 tons butter, 1,379 tons hides, 803 tons wool and 6,694 tons lumber. The three Vanderbilt lines carried 42.0 per cent. of all the business, while the two Pennsylvania lines carried but 21.2 per cent.